Exhibit 7

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Brett Bernath et al.		
U.S. Patent No.:	8,631,450 B1	Attorney Docket No.:	45035-0031IP1
Issue Date:	January 14, 2014		
Appl. Serial No.:	11/231,349		
Filing Date:	September 19, 2005		
Title:	BROADBAND LOCAL AREA NETWORK		

Mail Stop Patent Board
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 8,631,450 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

TABLE OF CONTENTS

EXHIBITS

DISH-1001	U.S. Patent 8,631,450 to Bernath *et al.* ("the '450 Patent")
DISH-1002	Excerpts from the Prosecution History of the '450 Patent ("the Prosecution History")
DISH-1003	Declaration of Tim A. Williams, Ph.D
DISH-1004	Curriculum Vitae of Dr. Williams
DISH-1005	U.S. Patent 5,521,906 to Grube *et al.* ("Grube")
DISH-1006	U.S. Patent 6,473,438 to Cioffi *et al.* ("Cioffi")
DISH-1007	Canadian Patent Application 2350203 to Matsumoto ("Matsumoto")
DISH-1008	RESERVED
DISH-1009	Microsoft Computer Dictionary, Fourth Ed., 1999 ("Microsoft")
DISH-1010	U.S. Patent No. 7,295,518 to Monk *et al.* ("Monk")
DISH-1011	U.S. Patent No. 6,252,900 to Liu *et al.* ("Liu")
DISH-1012	U.S. Patent No. 4,679,227 to Hughes-Hartogs ("Hughes-Hartogs")
DISH-1013	U.S. Patent No. 6,259,746 to Levin *et al.* ("Levin")
DISH-1014	U.S. Patent No. 6,072,779 to Tzannes *et al.* ("Tzannes")
DISH-1015	U.S. Patent No. 4,866,395 to Hostetter ("Hostetter")

DISH-1016	U.S. Patent No. 6,298,092 to Heath *et al.* ("Heath")
DISH-1017-1020	RESERVED
DISH-1021	Complaint filed in *Entropic Communications, LLC v. DISH Network Corporation, et al.*, Case No. 2:23-cv-01043 (C.D. Cal. Feb. 10, 2023)
DISH-1022	Proof of Service of Summons and Complaint on DISH Network Corporation in *Entropic Communications, LLC v. DISH Network Corporation, et al.*, Case No. 2:23-cv-01043 (C.D. Cal. Feb. 23, 2023)
DISH-1023	Federal Court Management Statistics for September 2023 published by the Administrative Office of the U.S. Courts, retrieved from https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distcomparison0930.2023.pdf
DISH-1024	Order Granting Stipulation Setting Claim Construction Schedule, *Entropic Communications, LLC v. DISH Network Corporation et al*., Case 2:23-cv-01043-JWH-KES (C.D. Cal. Aug. 21, 2023)
DISH-1025	LegalMetric Time to Trial Report, Central District of California, Patent Cases (Jan. 2021 – Nov. 2023)

LISTING OF CHALLENGED CLAIMS

Claim 29	
[29pre]	A broadcasting method within a Broadband Coaxial Network ("BCN"), comprising:
[29a]	a transmitting node transmitting a probe signal to a plurality of receiving nodes;
[29b]	the transmitting node receiving a plurality of response signals comprising a plurality of bit-loading modulation schemes from the plurality of receiving nodes,
[29c]	wherein each of the plurality of receiving nodes receives the probe signal through a corresponding channel path,
[29d]	determines transmission characteristics of the corresponding channel path,
[29e]	determines a bit-loading modulation scheme for the corresponding channel path based on the transmission characteristics, and

[29f]	transmits a response signal to the transmitting node informing the transmitting node of the bit-loading modulation scheme for the corresponding channel path;
[29g]	the transmitting node comparing the plurality of bit-loading modulation schemes to determine a common bit-loading modulation scheme; and
[29h]	the transmitting node transmitting a broadcast signal relaying the common bit-loading modulation scheme to the plurality of receiving nodes.
Claim 30	
[30]	The broadcasting method within the BCN of claim 29, wherein the broadcast signal comprises handshake data.
Claim 31	
[31]	The broadcasting method within the BCN of claim 29, wherein the broadcast signal is a communication message comprising video data, music data, or voice data.

Claim 32	
[32]	The broadcasting method within the BCN of claim 29, wherein each node of the BCN determines a respective common bit-loading modulation scheme for broadcasting to the other nodes of the BCN.
Claim 33	
[33]	The broadcasting method within the BCN of claim 29, further comprising the transmitting node broadcasting a signal based on the common bit-loading modulation scheme to the plurality of receiving nodes simultaneously.
Claim 34	
[34pre]	A Broadband Coaxial Network ("BCN") comprising
[34a]	a first BCN modem comprising a first controller; and
[34b]	a plurality of BCN modems comprising a plurality of controllers;
[34c]	wherein the first controller is configured to transmit a probe signal to the plurality of controllers,

[34d]	receive a plurality of response signals comprising a plurality of bit-loading modulation schemes from the plurality of controllers,
[34e]	wherein each of the plurality of controllers is configured to receive the probe signal through a corresponding channel path,
[34f]	determine transmission characteristics of the corresponding channel path,
[34g]	determine a bit-loading modulation scheme for the corresponding channel path based on the transmission characteristics, and
[34h]	transmit a response signal to the first controller informing the first controller of the bit-loading modulation scheme for the corresponding channel path,
[34i]	compare the plurality of bit-loading modulation schemes to determine a common bit-loading modulation scheme, and
[34j]	transmit a broadcast signal relaying the common bit-loading modulation scheme to the plurality of controllers.

Claim 35	
[35]	The BCN of claim 34, wherein the broadcast signal comprises handshake data.
Claim 36	
[36]	The BCN of claim 34, wherein the broadcast signal is a communication message comprising video data, music data, or voice data.
Claim 37	
[37]	The BCN of claim 34, wherein each controller of the plurality of controllers determines a respective common bit-loading modulation scheme for broadcasting to the other controllers of the plurality of controllers and the first controller.
Claim 38	
[38]	The BCN of claim 34, wherein the first controller is further configured to broadcast a signal based on the common bit-loading modulation scheme to the plurality of controllers simultaneously.

I. INTRODUCTION

DISH Network L.L.C., DISH Network Service L.L.C., DISH Network Corporation, and DISH Network California Service Corporation, (collectively, "Petitioner" or "DISH") petition for *Inter Partes* Review ("IPR") under 35 U.S.C. §§311–319 and 37 C.F.R. §42 of Claims 29-38 ("the Challenged Claims") of the U.S. Patent No. 8,631,450 (the "'450 Patent").

During prosecution, the claims of the '450 Patent were only allowed after the Applicant added subject matter for determining the claimed common bit-loading modulation scheme[1] (e.g., limitations [29a, d-h]). DISH-1002, 116-23.

Grube, which was not before the Examiner and is the primary reference relied upon herein, teaches the determination of a common bit-loading modulation scheme. Both the '450 Patent and Grube describe networks of nodes that have multiple channel paths for transmitting packets. A POSITA would have understood that both the '450 Patent and Grube determine a bit-loading modulation scheme by comparing schemes associated with various channel paths to select the lowest common modulation value for subsequent communications. *Compare* DISH-1001, FIG. 19, *with* DISH-1005, 14:36-15:26, 18:18-67.

---

[1] Potential modulation schemes include, e.g., 64 QAM. DISH-1001, 20:52-21:2.

Thus, for the following grounds, Petitioner respectfully requests *inter partes* review of Claims 29-38.

II. REQUIREMENTS FOR IPR—37 C.F.R. §42.104

A. Grounds for Standing—37 C.F.R. §42.104(a)

Petitioner certifies that the ’450 Patent is available for IPR and Petitioner is not barred or estopped from requesting this review. The present Petition is filed within one year of service of a complaint against DISH in 2:23-CV-01043 (C.D. Cal.). *See* DISH-1021; DISH-1022.

B. Challenge and Relief Requested—37 C.F.R. §42.104(b)

This Petition demonstrates a reasonable likelihood of prevailing as to at least one Challenged Claim. Petitioner requests institution of IPR and cancellation of all Challenged Claims on the following grounds. The expert declaration (DISH-1003, ¶¶1-326) of Dr. Williams provides complementary explanations and support for each ground.

Ground	Patent Claims	Basis
1	**29-31, 34-36**	§103: Grube
2	**29-31, 34-36**	§103: Grube-Cioffi
3A, 3B	**29-38**	§103: Grube-Matsumoto/ Grube-Cioffi-Matsumoto

Each reference pre-dates December 2, 2004, the earliest possible date to which

the ’450 Patent can claim priority.[2]

Reference	Prior Art Date (at least as early as)	Basis (at least under)
Grube U.S. 5,521,906 (DISH-1005)	Filed 1995-01-26; published 1996-05-28	§102(b)
Cioffi U.S. 6,473,438 (DISH-1006)	Filed 1995-06-02; published 1995-12-14	§102(b)
Matsumoto CA 2350203 (DISH-1007)	Filed 2000-10-03; published 2001-04-12	§102(b)

C. Claim Construction—37 C.F.R. §42.104(b)(3)

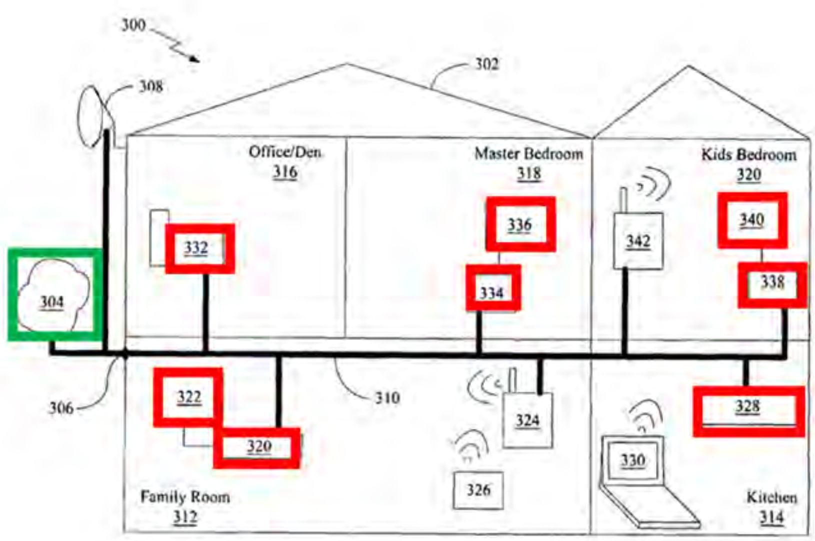
Because the Challenged Claims are obvious under any reasonable interpretation, no express constructions are required in this proceeding. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“claim terms need only be construed to resolve a controversy”). To be clear, Petitioner reserves the right to address any construction proposed by Patent Owner or the Board. Petitioner also reserves the right to pursue constructions in district court that are necessary to decide matters of infringement and validity under 35 U.S.C. §112 that exceed the scope of an *inter partes* review. *See* 35 U.S.C. §311(b). Petitioner does not concede that the Challenged Claims satisfy statutory requirements, including those under 35 U.S.C. §112.

[2] Petitioner does not concede the claimed priority.

III. THE '450 PATENT

A. Summary

The '450 Patent relates to "[a] Broadband Coaxial Network (BCN) network formed by a plurality of common coaxial network elements." DISH-1001, 4:12-13. This network can be implemented within a home or a building, as depicted in Figure 3[3] of the '450 Patent, where cable/terrestrial network 304 is connected to network components (*e.g.*, home-media server 320 connected to television/video monitor 322) via a coaxial cable connection.



DISH-1001, Fig. 3.

The '450 Patent acknowledges that it was already known in the art to employ

[3] Color annotations throughout have been added unless otherwise noted.

bit-loading modulation in broadband coaxial cable networks for wired communications between a service provider and multiple CPEs (customer premise equipment "such as … televisions, video monitors" etc.) in home or building environments. *Id.*, 1:26-44, FIG. 1; DISH-1003, ¶¶23-26.

The '450 Patent's coaxial cable network is configured to determine the claimed "common bit-loading modulation scheme."[4] DISH-1001, Claims 29, 34. In such a network, a "transmitting node" "transmit[s] a probe signal to a plurality of receiving nodes." *Id.*, Claim 29. Each of the "plurality of receiving nodes" "receives the probe signal through a corresponding channel path," "determines transmission characteristics of the corresponding channel path," "determines a bit-loading modulation scheme for the corresponding channel path based on the transmission characteristics," and "transmits a response signal to the transmitting node informing the transmitting node of the bit-loading modulation scheme for the corresponding channel path." *Id.* After the "transmitting node receiv[es] a plurality of response signals comprising a plurality of bit-loading modulation schemes from the plurality

[4] Coaxial cabling, bit-loading, and modulation schemes for multi-device communications were well-known. DISH-1003, ¶¶27-37; *see, e.g.*, DISH-1010, 8:19-26; DISH-1011, 8:14-31.

of receiving nodes," the transmitting node "compar[es] the plurality of bit-loading modulation schemes to determine a common bit-loading modulation scheme" and "transmit[s] a broadcast signal relaying the common bit-loading modulation scheme to the plurality of receiving nodes." *Id.*; DISH-1003, ¶38.

B. Prosecution History

After the claims were repeatedly rejected during the eight-year prosecution, Applicant added claims 34-43 (now issued claims 29-38), the subject matter of which was not previously recited in any claims. DISH-1002, 139-41. The Examiner then contacted the Applicant telephonically to indicate that claims 34-43 comprised allowable subject matter. *Id.*, 126. The Applicant amended the remaining independent claims to incorporate at least the subject matter of independent claim 34 (the steps for determining the common bit-loading modulation scheme). *Id.*, 116-23. The Examiner then issued a Notice of Allowance. *Id.*, 34-44; DISH-1003, ¶¶39-41.

C. Level of Ordinary Skill in the Art

For the '450 Patent, a person of ordinary skill in the art ("POSITA") would have a degree in electrical engineering, computer engineering, or a related field and experience working in signal processing and/or communication systems/networks, e.g., a bachelor's and three or more years of experience; a master's and at least one year of experience; or a doctorate and some work experience. DISH-1003, ¶¶1-14,

19-20. Additional education could substitute for professional experience, or *vice versa*. *Id.*

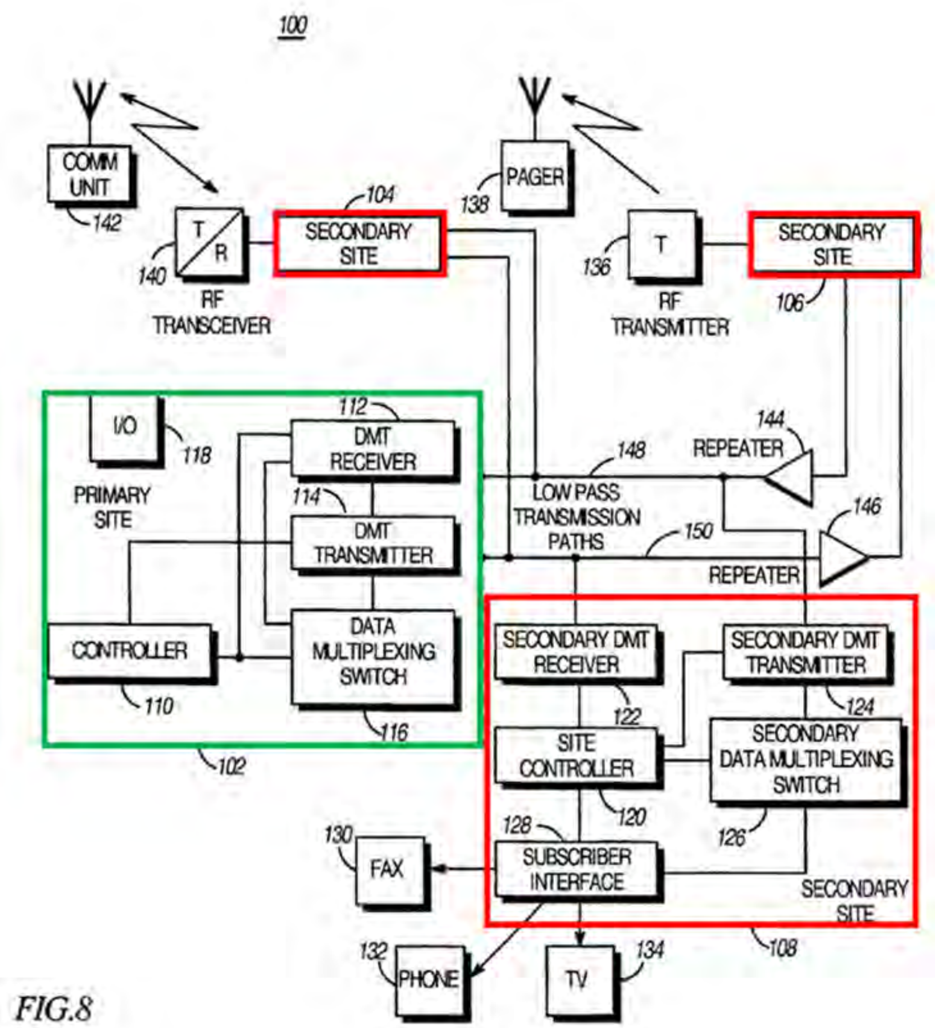
IV. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. GROUND 1: Claims 29-31, 34-36 are Rendered Obvious by Grube

1. Overview of Grube

Grube focuses on improving reliability and bandwidth over existing wiring in a home environment, e.g., telephone lines, to facilitate data/video transmission without compromising other services. *See* DISH-1005, 2:48-3:17. To do so, Grube uses frequency division multiplexing with discrete multi-tone ("DMT") modulation over multiple carrier channels to facilitate communication between a primary site and multiple secondary sites. *Id.*, 4:21-28 (describing "one-to-many … communications"), 6:57-60 (describing "communication system infrastructure utilizing low pass transmission path[s], i.e.[,] twisted pair telephone line"). Grube's DMT system, like the '450 Patent, uses quadrature amplitude modulation ("QAM") to ensure a central unit communicates efficiently with multiple subscribers. *Id.*, 3:27-28, 3:37-44, 6:57-67, 16:53-17:20, FIG. 8, FIG. 15; DISH-1001, 3:6, 20:21-21:2, FIGS. 13A-C.

Figure 8 depicts a communications system with a primary site (green) connected to a plurality of secondary sites (red):



DISH-1005, Fig. 8.

The primary site includes a controller, a DMT transmitter, and a DMT receiver. *Id.* at 6:60-62, FIG. 8. Each secondary site includes a site controller, a secondary DMT receiver, and a secondary DMT transmitter. *Id.* at 6:62-67. The primary site is "coupled" to the plurality of secondary sites "via … low pass transmission paths." *Id.* at 6:62-64.

Grube ensures that the secondary sites have enough bandwidth by determining the secondary sites involved in a transmission, determining a lowest-common-denominator bit-loading table across all secondary sites, and allocating channels based on bandwidth requirements. *Id.*, 14:36-48, 7:16-8:52.

Before transmitting information over the network, "an inbound control channel and an outbound control channel [are] established over the low pass transmission paths." *Id.*, 7:16-18. The "outbound control channel" is established when the primary site transmits a "training signal" to each secondary site. *Id.*, 7:34-36. Upon receiving the training signal, each secondary site performs a "spectral response analysis of the outbound low pass transmission path based on the training signal," then creates "bit loading information" based on that analysis. *Id.*, 7:37-40. The secondary sites provide this bit-loading information to the primary site, after which the primary site "generates a lowest common denominator (LCD) bit loading table as a compilation of all of the site bit loading tables." *Id.*, 7:41-48. Using the LCD bit loading table and channel bandwidth requirements, the primary site selects at least one outbound carrier channel as the outbound control channel. *Id.*at 7:48-52; DISH-1003, ¶¶42-47.

Grube depicts the selection of a lowest common denominator (LCD) bit loading table in Figure 17. DISH-1005, 18:17-67.

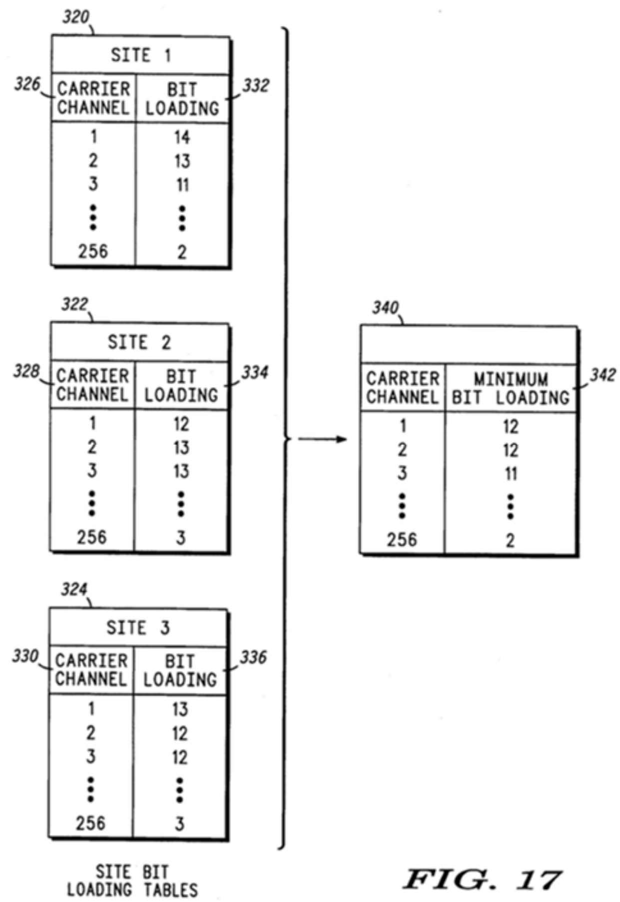


FIG. 17

DISH-1005, Fig. 17.

To determine the outbound carrier channel, the bit loading tables of each secondary site (e.g., tables 332, 334, and 336 depicted in Figure 17) are compared to select the LCD. *Id.*, 18:27-57. For example, the LCD bit loading table is updated with the least common bit loading for Carrier Channel 1 (twelve) after a comparison of bit loading for Carrier Channel 1 across all secondary sites—in this example, up to fourteen for Site 1, up to twelve for Site 2, and up to thirteen for Site 3. *Id.*, FIG. 17. After the outbound control channel is determined, “the primary site transmits a

signal to all the secondary sites indicating the carrier channel allocations as the control channel." *Id.*, 18:9-12. Grube describes a similar process for establishing the inbound control channel. *Id.*, 7:53-67; DISH-1003, ¶¶48-51.

Grube's DMT transmission schemes are used to support telephone calls and video/audio data transfers using existing telephone lines. DISH-1005, 10:45-54. Grube's methodology applies to secondary sites equipped with telephones, televisions, and cable boxes, or "any other type of device that can receive digital information." *Id.*, 8:29-37, 12:58-13:6. Simply put, Grube modulates data, and a POSITA would have understood that Grube's modulation techniques are agnostic to data content. *See id.*, 7:34-52; DISH-1003, ¶52.

A POSITA would have further understood that Grube's modulation techniques are widely applicable to wired communications networks using pre-existing transmission paths. *See* DISH-1005, 4:24-28 (recognizing "a need exists for a one-to-many … communication system infrastructure that utilizes existing telephone lines while providing [] highly reliable service"), 12:67-13:6 (explaining secondary sites can interface with "a television set 212, a cable box, a VCR" and other typical network elements); DISH-1003, ¶53. By using pre-existing wiring, Grube's method avoids costly new infrastructure expenses. DISH-1005, 57:29-38. Accordingly, a POSITA would have understood Grube's methodology to apply to

other pre-existing wired communications networks (*e.g.*, coaxial cable networks). DISH-1003, ¶53. Thus, a POSITA would have been motivated to use and modify the teachings of Grube to solve the issues in the ’450 Patent. *Id*.

2. Claims 29-31, 34-36

(a) Claim 29

[29pre] “A broadcasting method within a Broadband Coaxial Network (“BCN”), comprising:”

To the extent the preamble is limiting, Grube renders obvious [29pre]. DISH-1003, ¶¶57-71.

Grube[5] “provides a method and apparatus for establishing a communication system infrastructure utilizing low pass transmission path, i.e.[,] twisted pair telephone line.” DISH-1005, 6:57-60. Grube notes that “Asymmetrical Digital Subscriber Loop, or Link, (ADSL)” is a technique for “increas[ing] the transmission

---

[5] Grube is analogous art to the ’450 Patent because both are from the same field of endeavor (one-to-many communication network infrastructures) and because Grube is pertinent to the problems that the ’450 Patent is concerned with (i.e., enabling one-to-many communications in a network using existing wired communications infrastructure). DISH-1003, ¶¶54-56; DISH-1001, 3:65-67, 4:1-8, 23:41-24:9; DISH-1005, 1:6-8, 2:48-3:17, 4:21-28, 6:57-67.

capabilities of a twisted pair copper telephone line." *Id.*, 2:49-54. However, the ADSL system was "designed for one-to-one communications," thus creating a need for "a one-to-many … communication system infrastructure that utilizes existing telephone lines." *Id.*, 4:21-28; DISH-1003, ¶¶57-58.

"Broadcasting Method"

Grube discloses or renders obvious the claimed "broadcasting method." Grube developed a one-to-many communication system utilizing "twisted pair telephone line." DISH-1005, 6:60-62. Grube's network has "a primary site" with a DMT transmitter and receiver, coupled to a plurality of "secondary sites," each with a DMT transmitter and receiver, via low pass transmission paths (*i.e.*, the twisted pair telephone lines). *Id.*, 6:60-67. Grube's Figure 8 shows the transmission of data from a primary site 102 (green) along low pass transmission paths 148 to a plurality of secondary sites 104, 106, and 108 (red). *See also* DISH-1003, ¶¶59-61.

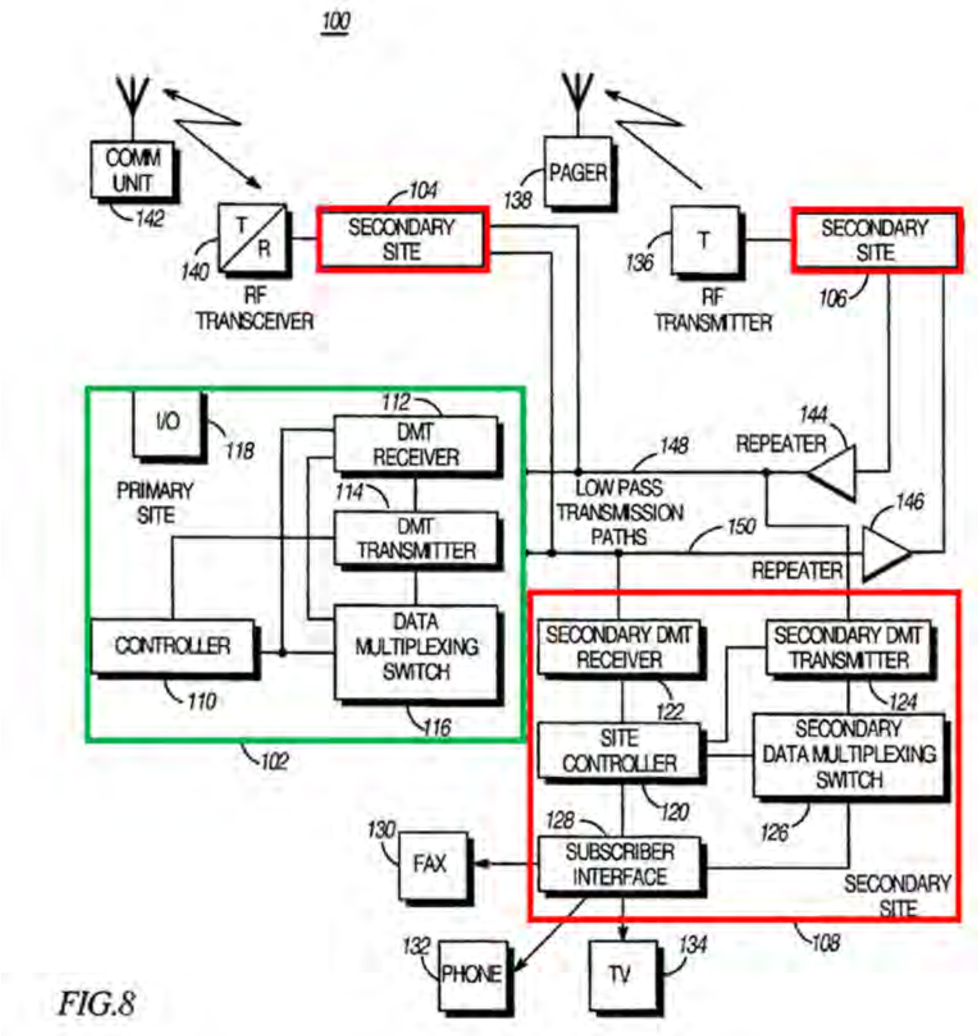


FIG.8

DISH-1005, Fig. 8.

The primary site transmits to each of the secondary sites simultaneously, which corresponds to broadcasting as defined in the ’450 Patent. *See* DISH-1005, 15:38-40, FIG. 14 (the “primary site transmits a first training signal to all secondary sites”); *see also* DISH-1001, 20:12-16 (the network “ensure[s] that both Node B … and Node C … are able to receive a broadcast signal transmitted from Node A … [by utilizing] the common bit-loaded modulation scheme”).

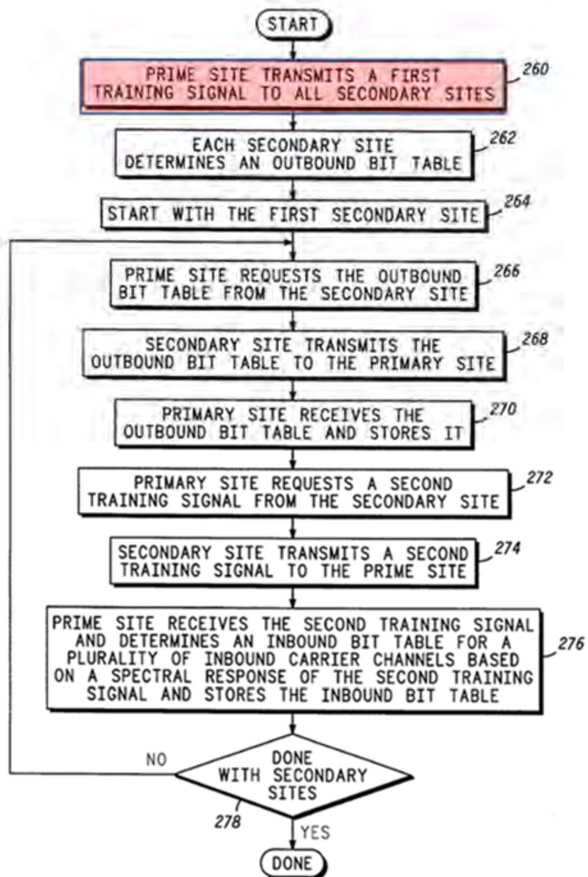


FIG. 14

DISH-1005, Fig. 14.

Broadband Coaxial Network

Grube renders obvious that the claimed "broadcasting method" is implemented "within a Broadband Coaxial Network." Grube couples its secondary sites to "a communication unit 142, … a telephone 132, … or any other type of device that can receive digital information." DISH-1005, 8:46-53; *see also id.*, FIG. 8. While it was well-known that such devices were commonly used in broadband coaxial networks (DISH-1003, ¶62-64), Grube does not explicitly describe its

system as such a network. *See generally* DISH-1006. As Dr. Williams explains, however, a POSITA would have been motivated and would have found it obvious to implement Grube's system and method in broadband coaxial networks. DISH-1003, ¶¶62-71.

The '450 Patent's common bit-loading modulation scheme is a solution to "utilizing the home coaxial cable as a medium for high speed home networking by utilizing frequencies above the ones currently used by the Cable Operators for their cable service," which preexists and has large bandwidth available. DISH-1001, 3:11-21. A POSITA would have found it obvious to implement Grube's broadcasting method within a Broadband Coaxial Network to reap the well-known benefits of the high bandwidth available in coaxial networks. DISH-1003, ¶¶64-65.

A POSITA would also have been motivated to apply Grube's system and method to a coaxial cable network, because Grube was applicable to pre-existing home/building networks, and coaxial cable networks were already commonly used to connect various devices throughout a home/building, and because pre-existing coaxial wiring in the home presented inexpensive, robust network components to further Grube's goal of improving reliability and bandwidth for in-home video/data transmission. *Id.*, ¶66.

Further, coaxial cable networks used multiple carrier channels for data

transmissions among network devices, where each carrier channel might have different characteristics at different points in time. *Id.*, ¶67; (*see*, *e.g.*, DISH-1006, 16:67-17:25). Accordingly, transmission to multiple receiving devices in coaxial cable networks would have required a modulation scheme that enables communications to those receiving devices despite varying carrier channel characteristics. DISH-1003, ¶67. Grube directly addressed this problem by identifying the "lowest [bit loading] value for each carrier channel" across the various receiving nodes. DISH-1005, 14:11-15.

Additionally, a POSITA would have been motivated to implement Grube's system and method without modification in a broadband coaxial network. DISH-1003, ¶68. Coaxial cable networks and twisted-pair telephone line networks are structurally similar—both involve a single point-of-entry into a home/building networking environment, where wires connect each device in the network to the point-of-entry to accommodate multiple devices. *Id.*; *see also* DISH-1006, FIG. 1, 7:22-40 (depicting a "typical multiuser subscriber network," which could have "twisted pair phone lines" or "coaxial cables" as the "transmission media").

Finally, a POSITA would have understood the applicability of Grube's DMT-based adaptive bit-loading communication schemes over carrier channels with different transmission characteristics to coaxial cable networks. DISH-1003, ¶69.

A POSITA would have known that coaxial cable networks use adaptive orthogonal frequency division multiplexing (OFDM) to perform modulation, which also involves multiple carrier channels possibly possessing different transmission characteristics from the point-of-entry to a network device. *Id.*, ¶69.

A POSITA would have also been motivated to apply Grube's method in the context of a broadband network. Grube recognized the benefit of increased bandwidth even in one-to-one communications to accommodate data transmissions. *See* DISH-1005, 4:21-24. Grube's twisted pair telephone line network is a broadband network because it has increased bandwidth and operates at high speeds. DISH-1003, ¶70 (defining "broadband" similarly). To the extent one might argue that Grube's network is not a broadband network, it would have been an obvious design choice for a POSITA to use a broadband network to ensure that Grube's system accommodates data transmissions among an increased number of devices while maintaining and/or increasing transmission speeds. *Id.*

A POSITA would therefore have found it obvious to implement Grube's techniques in the claimed "broadband coaxial network" to the extent the preamble is limiting. *Id.*, ¶¶62-71.

[29a] "a transmitting node transmitting a probe signal to a plurality of receiving nodes;"

Grube discloses [29a]. DISH-1003, ¶¶72-79.

The ’450 Patent explains that a probe signal is used to “determine[] the transmission characteristics of the channel path” and then “determine[] a bit-loaded modulation scheme for the transmission characteristics of the channel path in step 1910.” DISH-1001, 23:49-55. It also only references a transmitting node and a plurality of receiving nodes in a recitation of the claim limitations within the specification. *See generally id.* Thus, in the context of the ’450 Patent, a POSITA would have understood that the claim encompasses a transmitting node and a plurality of receiving nodes that are capable of performing the functions recited in the claims. DISH-1003, ¶73.

Similarly, Grube explains that its “communication system” includes a “primary site” (claimed “transmitting node”) and “a plurality of secondary sites … interoperably coupled to the primary site” (claimed “plurality of receiving nodes”). DISH-1005, 8:17-20. Grube configures the primary site to “transmit[] a training signal to each of the plurality of secondary sites.” *Id.*, 7:34-36; DISH-1003, ¶74. Grube’s Figure 14 demonstrates this transmission of training signals at Step 260 (highlighted below).

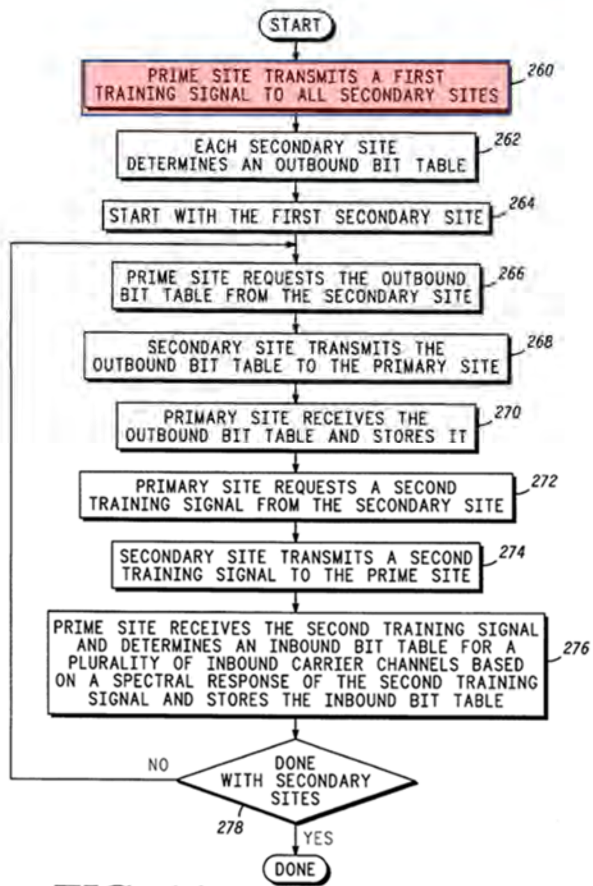
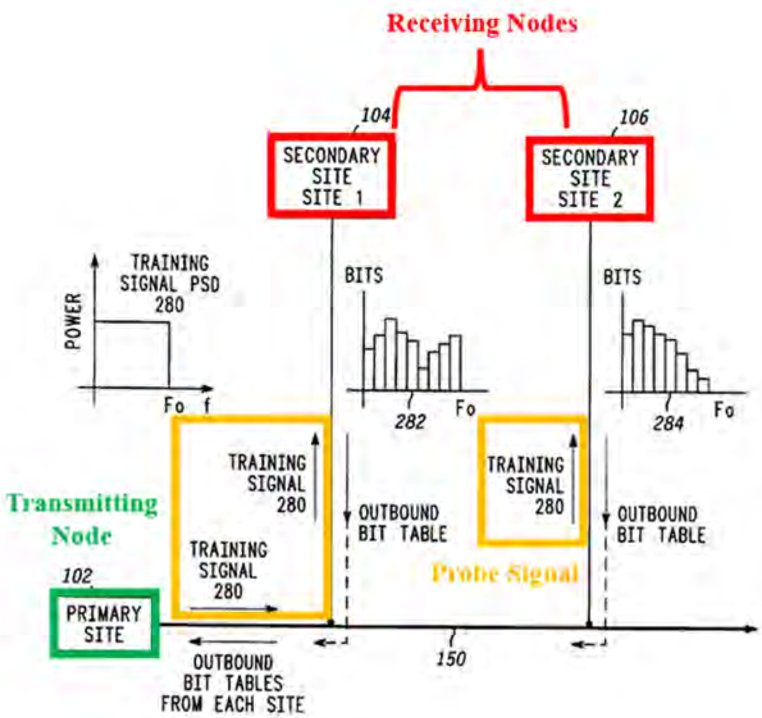


FIG. 14

DISH-1005, Fig. 14.

Like the '450 Patent, Grube's transmission of the training signal is part of its process to determine bit loading information. DISH-1001, FIG. 19; DISH-1005, FIG. 14; DISH-1003, ¶75. Grube's Figure 15 (below) further illustrates the transmission of a training signal. DISH-1005, FIG. 15 (the "primary site 102" transmits a "training signal 280" (yellow, claimed "probe signal") to secondary sites 104 and 106 (red, claimed "plurality of receiving nodes")); *see id.*, 16:53-56.



DISH-1005, Fig. 15.

Grube's "training signal 280" (claimed "probe signal") is used to determine the "spectral response" of the paths between the primary site and each of the secondary sites, and the "spectral response" is then used to determine a bit-loading table. *See* DISH-1005, 15:53-16:12 (calculating bit loading information from spectral response). Each bit-loading table is provided to the primary site, which uses the bit-loading tables to determine a "lowest common denominator (LCD) bit loading table" for the network. *See id.*, 7:44-47.

Thus, Grube's training signals (claimed "probe signal") transmitted from the primary site (claimed "transmitting node") to the secondary sites (claimed "plurality

of secondary sites") are used to probe characteristics of the transmission paths in the network and to determine the bit-loading modulation schemes used on those paths, and a POSITA would have understood Grube's "training signal" to correspond to the claimed "probe signal." *Id.*, 15:53-16:12, 18:18-57; DISH-1003, ¶¶72-79.

[29b] "the transmitting node receiving a plurality of response signals comprising a plurality of bit-loading modulation schemes from the plurality of receiving nodes"

Grube discloses or renders obvious [29b]. DISH-1003, ¶¶80-94.

The '450 Patent explains that the claimed "response signals" inform the transmitting node of the "corresponding bit-loaded modulation scheme" determined by each receiving node. DISH-1001, 23:61-63. Grube discloses a substantially similar process and thus discloses "response signals." DISH-1003, ¶¶80-94.

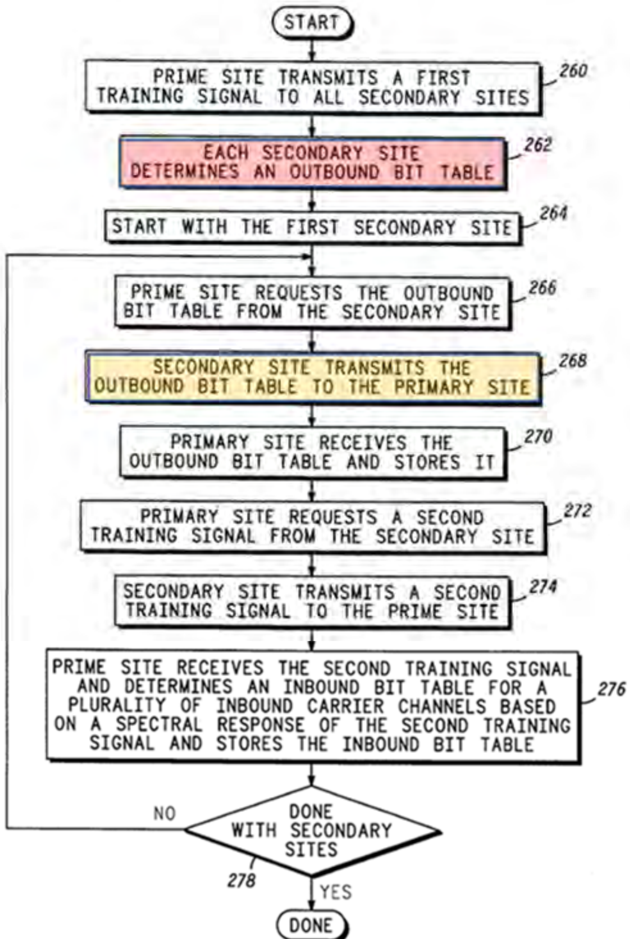


FIG. 14

DISH-1005, Fig. 14.

As depicted above, in response to receiving the training signal, each secondary site "determines an outbound bit table" (red), which is transmitted to the primary site (yellow). DISH-1005, FIG. 14, 15:36-38.

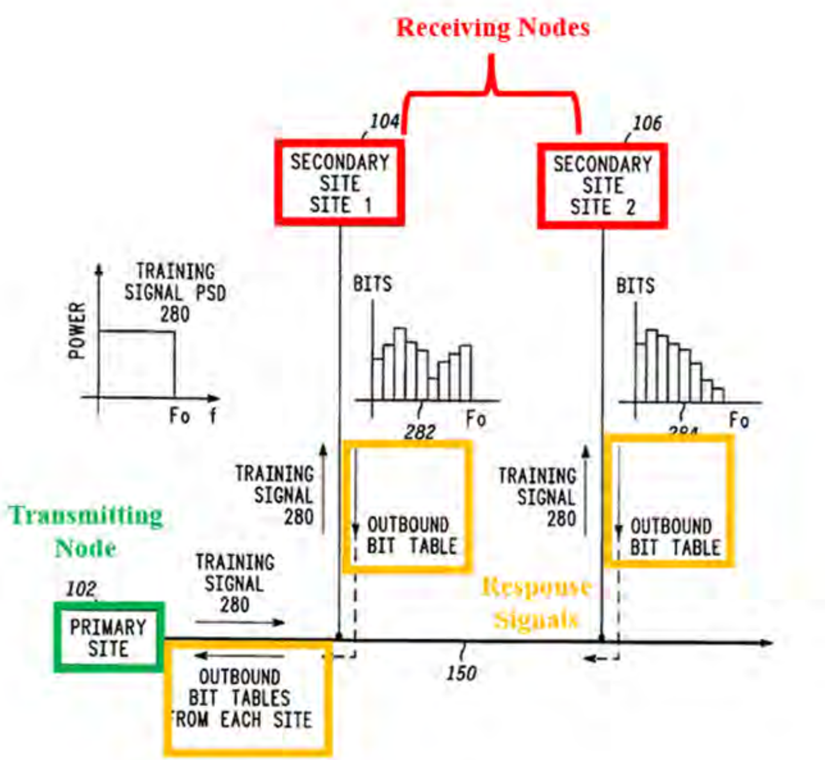
In discussing Step 264, Grube states that the "secondary site responds with its bit loading table," which contains bit loading information. *See id.*, 16:15-19, 16:65-17:3; *see also id.*, FIG. 14 (Steps 270 and 276). The bit loading table includes the

number of bits that each carrier channel can support (*i.e.*, bit loading information). *Id.*, 3:53-55. Accordingly, Grube's responses from the secondary site comprise at least a plurality of bit loading schemes.

Further, a POSITA would have understood that Grube's "bit loading of [each] carrier channel" is a "bit-loading modulation scheme." Grube specifies that the bit loading of each carrier channel coincides with a constellation encoding scheme. *Id.*, 51:51-64 (the "bit loading of a carrier channel indicates the number of constellation points, *i.e.*, the number of magnitude and phase combinations for the vector [associated with the carrier channel]. For example, if the bit loading of a carrier channel is 2, the number of constellation points is 4 (2^2) which can be equated to a binary numbering system."). Grube also uses QAM constellations as part of the modulation process. *Id.*, 34:45-52. For example, Grube recognizes that "[p]er the ADSL requirements, the minimum bit loading a carrier channel can have is 2 bits," and that "[w]ith two bits, the [QAM] signal generated from the two bits will have a single constellation point [(*see* DISH-1015, Figs. 1F, 4C)] in each quadrant. Having one constellation point in each quadrant is the minimum amount of constellation points that a QAM signal can represent." *Id*. Thus, because Grube configures its primary site and secondary sites for QAM, the bit loading information transmitted from each secondary site to the primary site is a modulation scheme. DISH-1003,

¶¶84-87. Grube confirms as much by teaching that transmission of bit loading information is sufficient to enable its system to perform modulation.

Further, Grube's Figure 15 depicts "outbound bit table[s.]" DISH-1005, FIG. 15 (each secondary site 104, 106 (red) generates an "outbound bit table" (yellow) that is transmitted to the primary site 102 (green)); *see id.*, 17:7-9 (FIG. 15's "outbound bit table" is also known as a "bit loading table").



DISH-1005, Fig. 15.

Grube's Figure 17 explains how the "outbound control channel bit loading table" is generated from the "outbound bit table[s]" or "bit loading table[s]" (also

known as an "outbound bit loading table" or a "site bit loading table"). *Id.*, FIG. 17, 18:17-25. Figure 17 shows each outbound bit loading table 320-324 containing "a carrier channel field 326-330 and a bit loading field 332-336" for every carrier channel. *Id.*

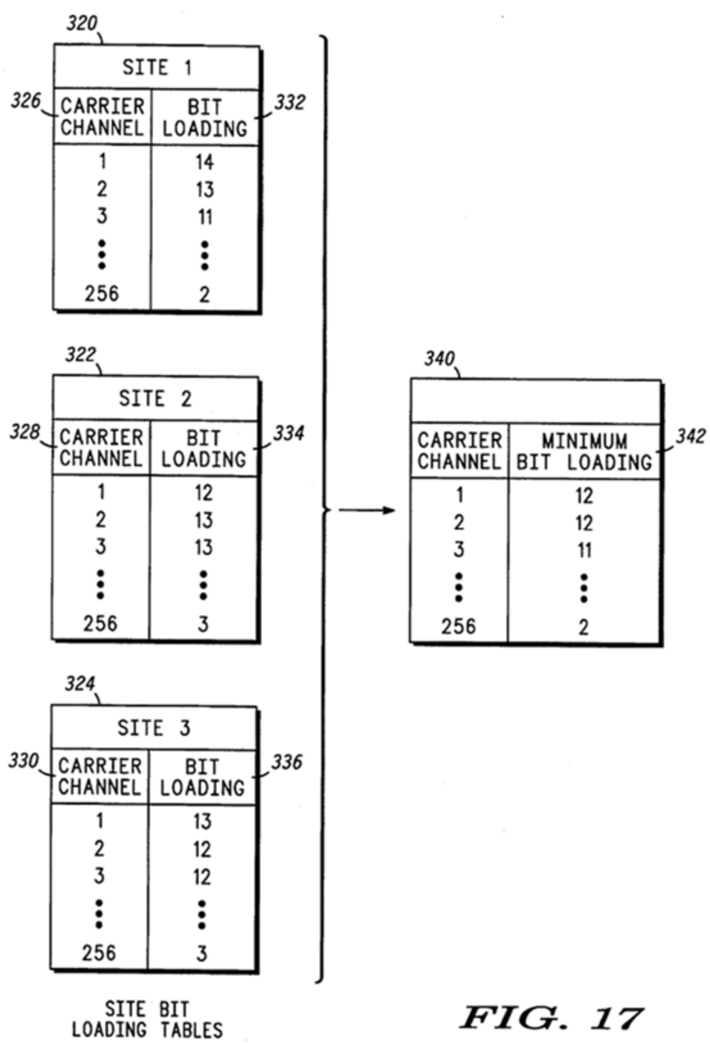


FIG. 17

DISH-1005, Fig. 17.

Figure 17 illustrates that bit loading tables are a format for organizing bit

loading information—the "site bit loading tables" 330, 332, 334 each display the corresponding bit loading information for each carrier channel. *Id.* A POSITA would have understood that "outbound bit table," "bit loading table," "outbound bit loading table," and "site bit loading table" are interchangeable, and that "bit loading information" and "outbound site bit loading information" indicate the information stored in the "bit loading table." DISH-1003, ¶¶88-90. Not only do Grube's bit loading tables indicate "a number of bits that [each] carrier channel can support," they also are a modulation scheme for each carrier channel between the primary site and the applicable secondary site. *Id.*, ¶90; DISH-1005, 3:53-55, 51:51-64 (explaining that the relationship between the number of bits supported by each carrier channel (n) and the modulation constellation size (x) is x-QAM = 2^n). A POSITA would thus have understood that Grube's outbound site bit loading information transmitted from the secondary sites (claimed "plurality of receiving nodes") to the primary site (claimed "transmitting node") to be the claimed "response signals comprising … bit-loading modulation schemes."

To the extent Patent Owner asserts that Grube does not disclose a "bit-loading modulation scheme," Grube renders it obvious. DISH-1003, ¶¶91-94. A POSITA would have understood that including a modulation scheme in Grube would maximize efficiency in signal transmissions by allocating modulation schemes to

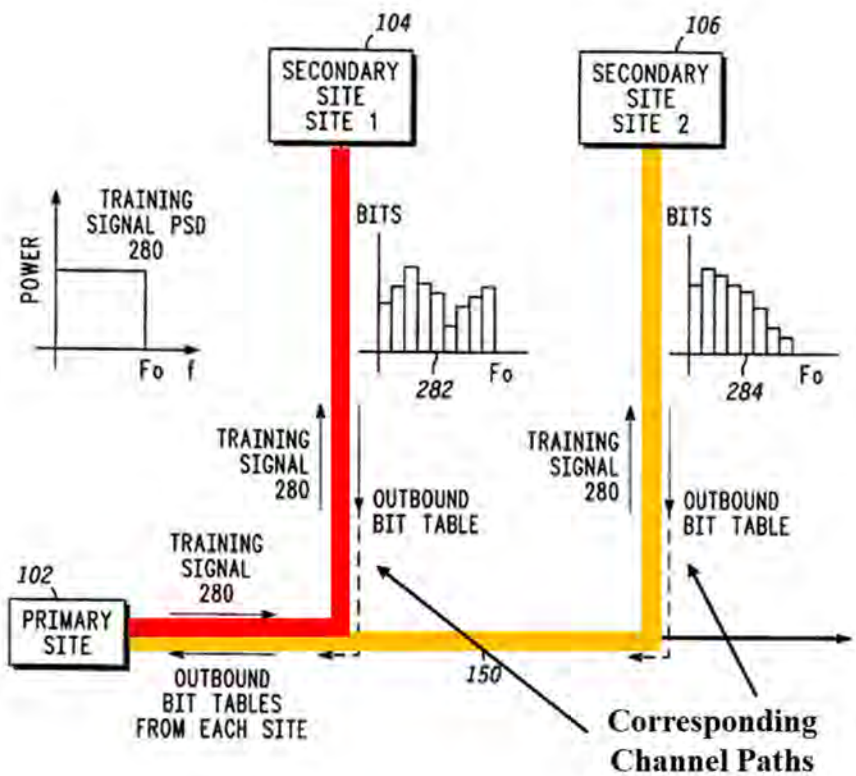
carrier channels based on bit-loading capabilities. *Id.*, ¶¶91-92. A POSITA would have been motivated to do so because it would improve the reception quality of signals transmitted on those channels. *Id*.

A POSITA would have also experienced a reasonable expectation of success in implementing a "bit-loading modulation scheme" in Grube. *Id.*, ¶93. As discussed, Grube discloses determining "bit loading information" for each carrier, which a POSITA would have understood to disclose a QAM constellation scheme. *Id*. Thus, a POSITA would have understood this to be the combination of prior art elements (a modulation scheme and coaxial cable networks) according to known methods (implementing modulation schemes in broadband coaxial networks with no modification) to yield predictable results (a broadband coaxial network with a modulation scheme to regulate signal transmissions). *Id.*

[29c] "wherein each of the plurality of receiving nodes receives the probe signal through a corresponding channel path,"

Grube discloses [29c]. DISH-1003, ¶¶95-99.

Grube explains that the primary site transmits a training signal to each secondary site. DISH-1005, 7:34-36; *see* §IV(A)(2)(a)[29a]. Grube discloses that each secondary site receives the training signal (claimed "probe signal"). *See* DISH-1005, 15:53-55; FIG. 15 (each secondary site (claimed "receiving nodes") receives the probe signal "through a corresponding channel path"), 16:63-64.



DISH-1005, Fig. 15.

Additionally, the purpose of the claimed "probe signal" is to determine the transmission characteristics of each channel path. *See* §IV(A)(2)(a)[29d]. To do so, Grube's training signal would necessarily have traveled along the corresponding channel paths. DISH-1003, ¶¶95-99.

[29d] "determines transmission characteristics of the corresponding channel path,"

Grube discloses [29d]. DISH-1003, ¶¶100-109.

Grube states that each secondary site, upon receiving the training signal, performs a spectral response analysis of the transmission path by "analyzing each of

the plurality of sinusoidal signals of the training signal." DISH-1005, 7:38-41, 15:57-59. Each site determines "magnitude, and/or phase" of each received sinusoidal signal and "compares it to the magnitude and phase of the known transmitted sinusoidal signal" to obtain a spectral response for each sinusoidal signal corresponding to a carrier channel from the differences. *Id.*, 15:59-65. Grube's spectral response is thus assessed for each carrier channel of a channel path (i.e., determination of transmission characteristics for the corresponding channel path). DISH-1003, ¶101.

Grube's spectral response is the claimed "transmission characteristics." DISH-1003, ¶¶102-104; *see* DISH-1008, 114 (stating "[d]etermination of a channel response ... from a known signal is well known in the art"); DISH-1009, 3 (defining "spectral response" as "[i]n relation to sensing devices, the relationship between the device's sensitivity and the frequency of the detected energy"); DISH-1012, 8:9-9:38, 9:63-68, 10:31-11:20, FIGS. 2, 5; DISH-1013, 1:62-2:8, 3:15-36. Grube explains that each secondary site calculates the bit loading for a particular channel from the spectral response. DISH-1005, 15:65-16:3. For example, "very little degradation" in the sinusoidal signal indicates that the carrier channel can handle up to a particular number of bits. *Id.* "Thus, as the quality of the transmission path decreases, the number of bits of a particular carrier channel can accommodate, or bit

loading, decreases." *Id.*, 16:5-8; *see also id.*, 16:8-12. Grube's spectral response therefore includes information about the amount of degradation of a transmitted signal caused by the carrier channel of the channel path, which is related to the quality of the channel path. DISH-1003, ¶104; DISH-1016, 3:46-4:8.

To reinforce this understanding, Grube further explains that the spectral response of the channel, and thus bit loading capabilities, is impacted by the attenuation of each carrier channel. DISH-1005, 16:64-17:6 ("Lower bit loading capabilities result from the transfer function of the outbound transmission path at particular carrier channels having more attenuation than other carrier channels which have less attenuation."); DISH-1003, ¶105; *see, e.g.*, DISH-1016, 3:46-4:8.

Grube further explains that the spectral response of the data lines must be periodically updated as lines' "transmission characteristics" change. DISH-1005, 19:2-5. Thus, Grube explains that its spectral response is the claimed "transmission characteristics of the channel path" of the '450 Patent. DISH-1003, ¶¶106-108.

Grube's spectral response thus includes attenuation and degradation per carrier channel in the channel path (where the spectral response is the claimed "transmission characteristics of the channel path"). *Id.*, ¶¶104-108.

[29e] "determines a bit-loading modulation scheme for the corresponding channel path based on the transmission characteristics, and"

Grube discloses or renders obvious [29e]. DISH-1003, ¶¶110-117.

Grube's responses include the claimed "plurality of bit-loading modulation schemes", and Grube's spectral responses indicate "transmission characteristics of the channel path." *See* §IV(A)(2)(a)[29b], [29d]. Grube states that each secondary site "calculate[s] the bit loading information from a spectral response of the output transmission path, wherein the bit loading information indicates, for each carrier channel, the number of bits that the carrier channel can support." DISH-1005, 13:54-58. The bit loading information may be "stored in a site bit loading table." *Id.*, 7:43-44. Grube's bit loading information (claimed "bit-loading modulation scheme") is thus determined based on the spectral response (indicating claimed "transmission characteristics of the channel path"). DISH-1003, ¶¶111-114; *see* §IV(A)(2)(a)[29b] (explaining why Grube's bit loading information is the claimed "bit-loading modulation scheme")); *see also* DISH-1014, 1:33-59, 6:28-39.

To the extent Patent Owner asserts that Grube does not disclose [29e], Grube renders obvious [29e]. DISH-1003, ¶¶115-116. A POSITA would have understood that including modulation schemes in Grube based on the spectral response would maximize efficiency in signal transmissions by allocating modulation schemes to carrier channels based on bit-loading capabilities. *Id.*, ¶115. Doing so would have improved the reception quality of signals transmitted on those channels. *Id.* As explained above, a POSITA would also have had a reasonable expectation of success

in implementing a "bit-loading modulation scheme" in Grube. *Id.*, ¶116; *see* §IV(A)(2)(a)[29b].

[29f] "transmits a response signal to the transmitting node informing the transmitting node of the bit-loading modulation scheme for the corresponding channel path;"

Grube discloses or renders obvious [29f]. DISH-1003, ¶¶118-120.

As explained regarding [29b], Grube's secondary sites each transmits or renders obvious transmitting a response signal to the transmitting node that includes a bit-loading modulation scheme for a corresponding channel path. *Id.*; *see* §IV(A)(2)(a)[29b]-[29c].

[29g] "the transmitting node comparing the plurality of bit-loading modulation schemes to determine a common bit-loading modulation scheme; and"

Grube discloses or renders obvious [29g]. DISH-1003, ¶¶121-130.

The '450 Patent states that determining a "common bit-load[ing] modulation scheme" means "comparing the carrier number signals" from one channel to the "corresponding carrier number signals" from another channel, and then "choosing the lowest corresponding modulation value for each carrier number." DISH-1001, 20:55-21:2. The '450 Patent illustrates this in Figures 13A-C (below).

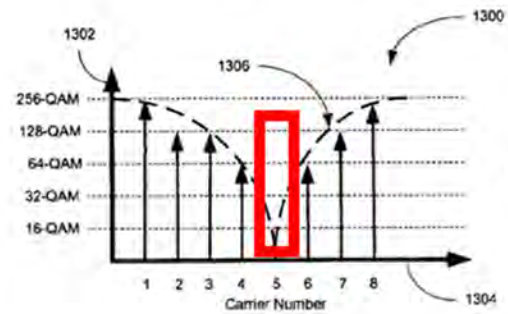


FIG. 13A

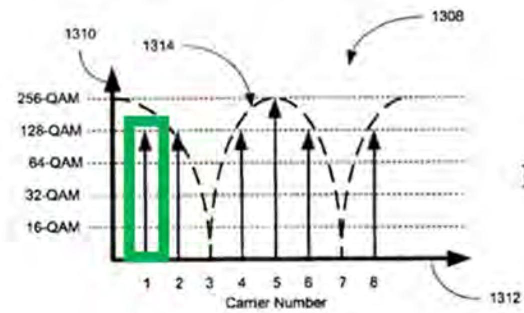


FIG. 13B

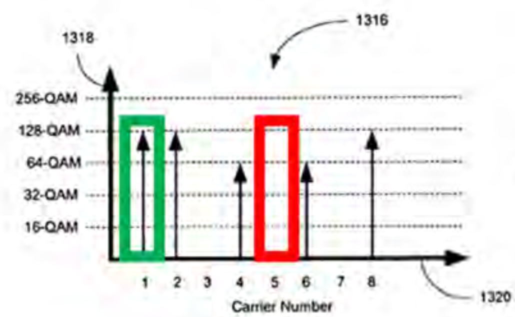


FIG. 13C

DISH-1005, Figs. 13A-C.

Each channel path includes eight carrier channels. *Id.*, FIGS. 13A-C. Figures 13A-B depict carrier frequency signals for a channel path between Nodes A and B and a channel path between Nodes A and C, respectively. *Id.* Figure 13C depicts the common bit-loading modulation scheme for a network involving Nodes A, B, and C. *Id.* As Figures 13A-B show, carrier number signal one may transmit at a

constellation size of 256 QAM over the AB channel but at a constellation size of 128 QAM over the AC channel (green). *Id.* Thus, as depicted in Figure 13C, the common bit-loading modulation scheme would permit carrier number signal one to only transmit at 128 QAM (green). *Id.* This pattern of choosing the lowest modulation value for each carrier number signal is replicated across each carrier number signal to arrive at the claimed "common bit-loading modulation scheme." *Id.* (depicting similar selection for carrier number signal five in red).

Grube states that the "bit loading, or bit numbers" for each carrier channel (claimed "plurality of bit-loading modulation schemes," *see* §IV(A)(2)(a)[29b]) "in the respective outbound bit loading tables are compared" to produce the "outbound control channel bit loading table," or the LCD bit loading table (claimed "common bit-loading modulation scheme"). DISH-1005, 8:5-8, 17:36-38. Grube acknowledges that the "outbound control channel bit loading table" is generated "from the plurality of site bit loading tables." *Id.*, 18:63-67.

As Figure 17 shows, Grube's comparison "determine[es], for each carrier channel within the bit loading tables, a lowest bit loading value, [thereby] obtain[ing] the lowest value for each carrier channel." *Id.*, 14:11-15.

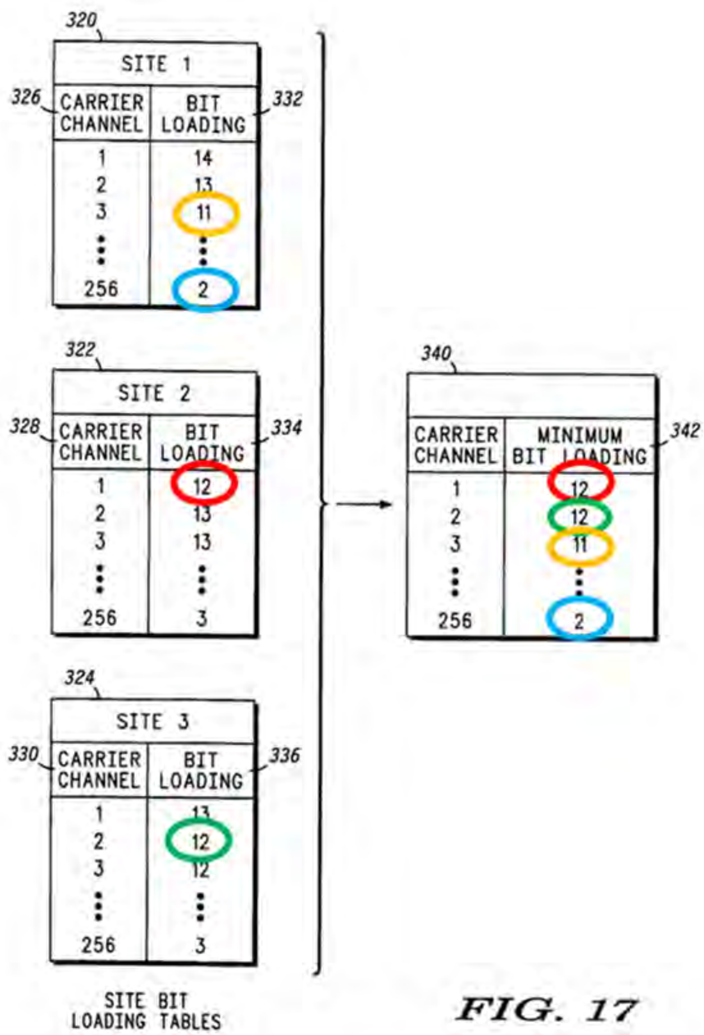


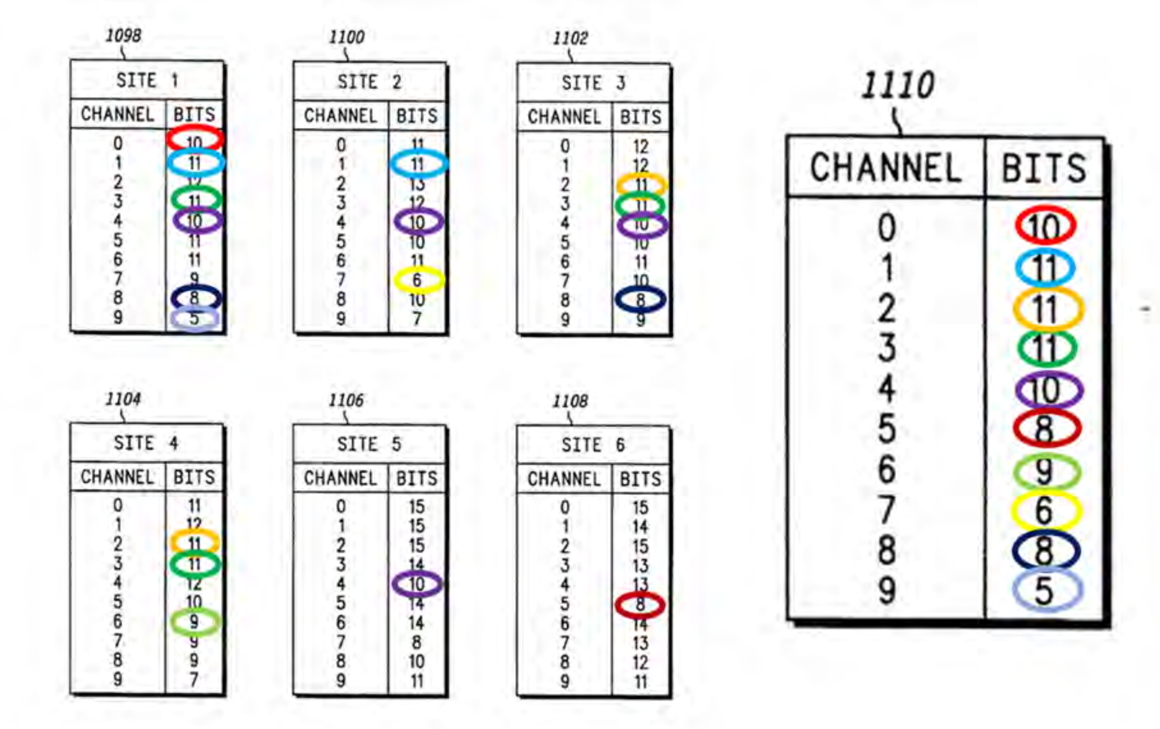
FIG. 17

DISH-1005, Fig. 17.

Grube's Figure 17 depicts three bit loading tables, each associated with a different secondary site. *Id.*, FIG. 17. For example, carrier channel one is capable of supporting up to 14 bits over the channel path to secondary site one, up to 13 bits over the channel path to secondary site two, and up to 13 bits over the channel path to secondary site three. *Id.* Because the lowest number of maximum bits supported

by carrier channel one is 12, carrier channel one of the "outbound control channel bit loading table" will only support up to 12 bits over the channel path (red). *Id.* A similar comparison is performed for each carrier channel of the channel path (green for carrier channel two, orange for carrier channel three, and blue for carrier channel 256). *Id.*

This comparison is again illustrated in Figures 53-54 of Grube (below).



DISH-1005, Figs. 53-54 (excerpted).

The bit loading values in the "control channel bit loading table 1110" further coincide with a constellation encoding scheme. When the "control channel bit loading table 1110" is generated, it indicates the number of bits that each carrier

channel can support across all secondary sites, which is also correlated to the number of QAM constellation points associated with each carrier channel. DISH-1003, ¶¶122-128; *see* §IV(A)(2)(a)[29b] (Grube's bit loading information indicates the number of constellation points for a vector associated with a carrier channel and therefore is the claimed "common bit-loading modulation scheme," because Grube's sites are configured for QAM and the bit-loading information in the "control channel bit loading table 1110" is sufficient for Grube's sites to perform modulation). The bit loading information in Grube's "control channel bit loading table 1110" of Grube is therefore the claimed "common bit-loading modulation scheme." *Id.*, ¶128.

To the extent Patent Owner asserts that Grube does not disclose limitation [29g], a POSITA would have found it obvious to include such a "scheme" in Grube. *Id.*, ¶179; *see* §IV(A)(2)(a)[29b].

[29h] "the transmitting node transmitting a broadcast signal relaying the common bit-loading modulation scheme to the plurality of receiving nodes."

Grube renders obvious [29h]. DISH-1003, ¶¶131-136.

Grube renders obvious a common bit-loading modulation scheme. *See* §IV(A)(2)(a)[29g]. Grube's primary site (claimed "transmitting node") transmits carrier channel allocations for data transmissions to the secondary sites (claimed "receiving nodes"). DISH-1005, 18:9-12 (when a call occurs over Grube's network, "[h]aving selected the outbound control channel, the primary site transmits a signal

to all the secondary sites indicating the carrier channel allocations as the control channel.").

Based on Grube's disclosures, a POSITA would have been motivated to transmit information from the primary site to the secondary sites to enable effective data transmissions. DISH-1003, ¶¶132-135. For example, a POSITA would have understood that transmitting the information in Grube's "control channel bit loading table 1110" to all secondary sites (claimed "transmitting … common bit-loading modulation scheme") prior to the occurrence of a call over the network would be beneficial so Grube's secondary sites can prepare to receive data transmissions from the primary site. DISH-1003, ¶133; *see, e.g.*, DISH-1007, 6:24-7:4, 5:9-14 (The "commonly-used carrier among the communication devices and the commonly-used number of bits that can be assigned to each carrier" is known as "mapping information," which may be provided to "all the communication devices" to allow them to operate "based upon the mapping information").

In sum, Grube renders obvious independent Claim 29.

(b) Claim 34

[34pre] "A Broadband Coaxial Network ("BCN") comprising"

To the extent the preamble is limiting, Grube renders obvious [34pre]. DISH-1003, ¶¶137-179.

Grube renders obvious a Broadband Coaxial Network. *See*

§IV(A)(2)(a)[29pre] (describing a method performed within a Broadband Coaxial Network).

[34a] "a first BCN modem comprising a first controller; and"

Grube discloses or renders obvious [34a]. DISH-1003, ¶¶140-148.

First, the "first BCN modem" performs the same functions as the "transmitting node" in Claim 29. *Compare* DISH-1001, Claim 29, *with id.*, Claim 34. Grube therefore discloses or renders obvious a first BCN modem because Grube discloses or renders obvious a transmitting node. *See* §IV(A)(2)(a)[29a].

Grube further discloses a *modem* (including a modulator and demodulator, DISH-1003, ¶¶142-145) that performs the same functions as the transmitting node. The primary site in Grube includes "DMT transmitter 114" and "DMT receiver 112." *See* DISH-1005, FIG. 8.

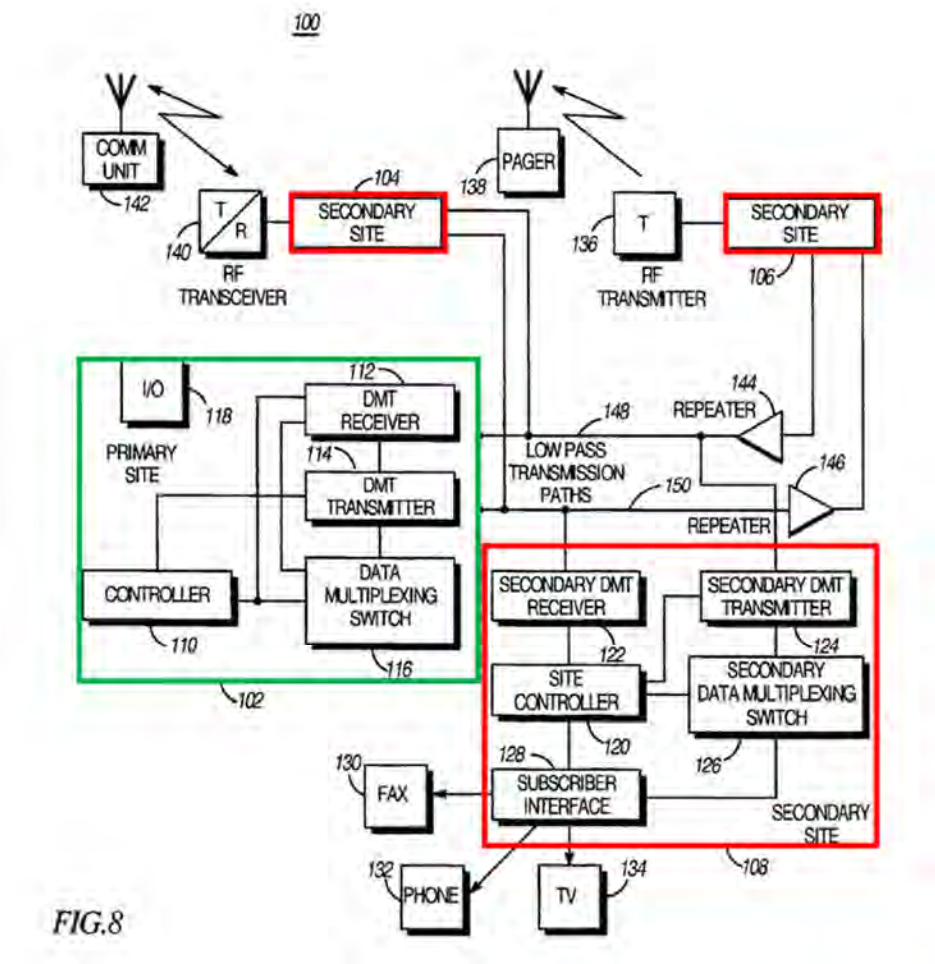
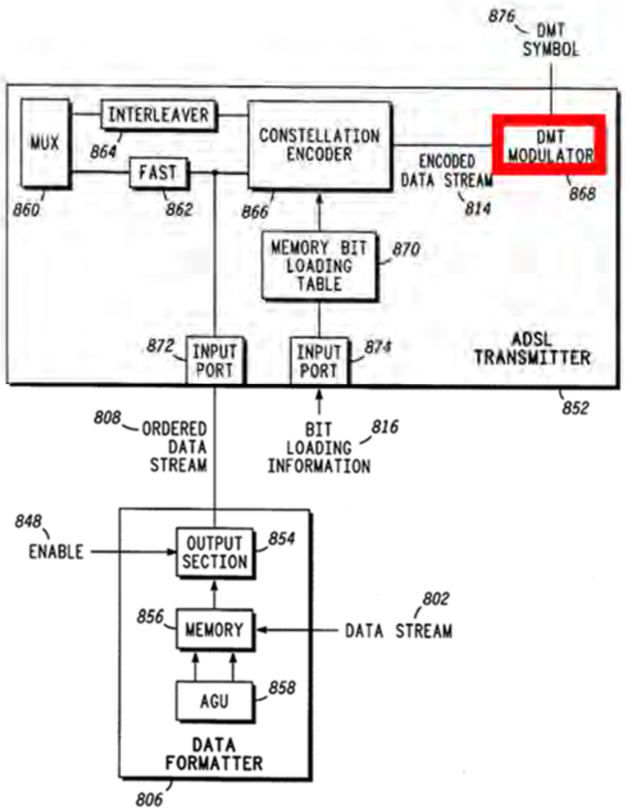


FIG.8

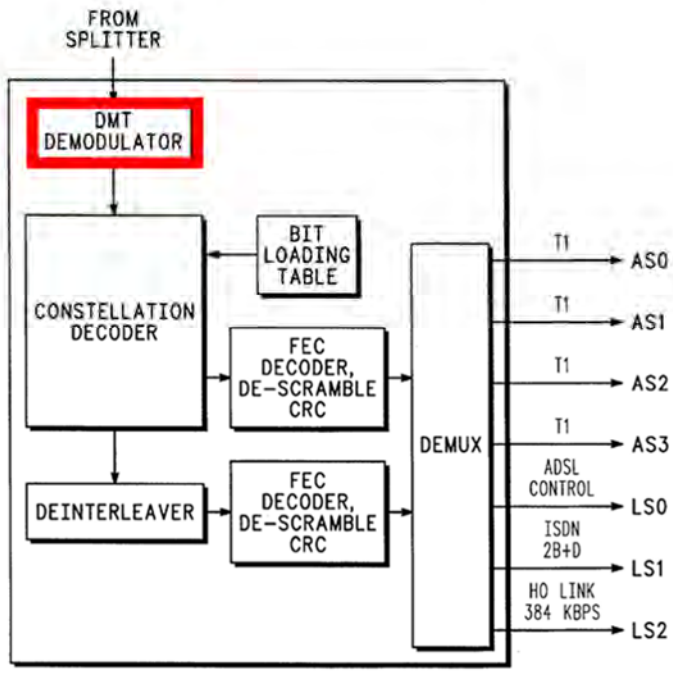
DISH-1005, Fig. 8.

Grube explains that the DMT transmitter in its ADSL system includes a DMT modulator. DISH-1005, 43:55-57, FIG. 36 (depicting DMT transmitter; DMT modulator in red).



DISH-1005, Fig. 36.

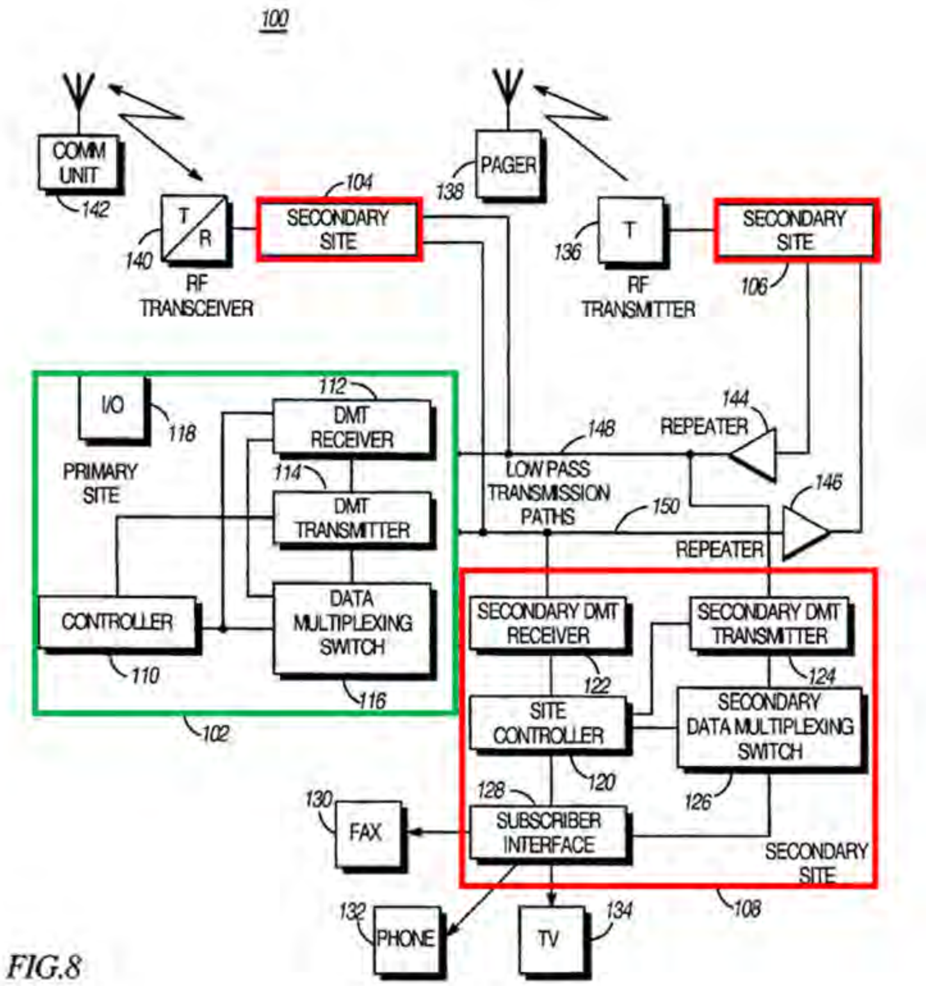
Grube further explains that it was well-known in the prior art for an ADSL system's DMT receiver to include a demodulator for demodulating the DMT symbol to produce a demodulated signal. *Id.*, 4:10-13; FIG. 7 (depicting the DMT receiver; DMT demodulator in red).



DISH-1005, Fig. 7 (prior art, annotated).

Grube further explains that the "primary site" (claimed "first BCN modem") "includes a controller 110." DISH-1005, 8:21-24; FIG. 8 (green). Grube's primary site's controller is capable of executing the primary site's functions. *Id.*, 10:3-6 ("Whichever type of processing device is used as the controller 110, it should have sufficient processing power and memory to execute the primary site functions described throughout this specification"). A POSITA would have understood that the controller combined with the DMT transmitter and DMT receiver (claimed "first controller") would be able to fully execute the primary site's (claimed "first BCN modem") functions, including transmitting and receiving data. DISH-1003, ¶¶146-

147.



DISH-1005, Fig. 8.

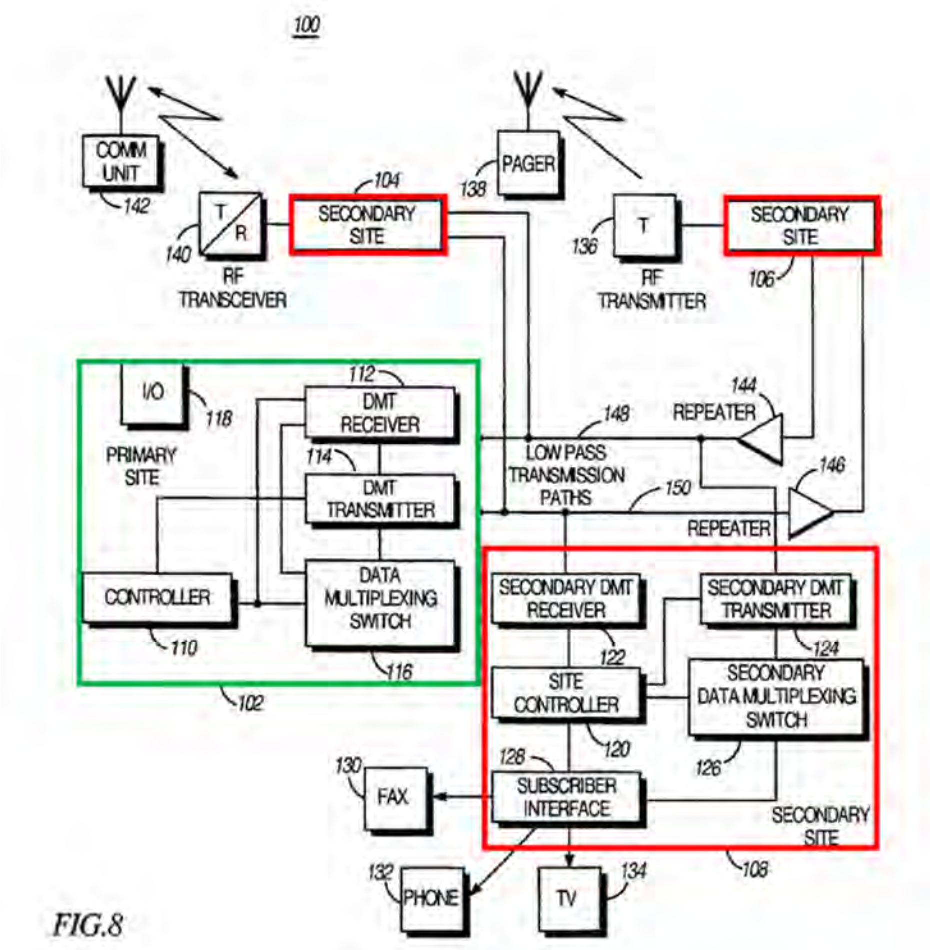
[34b] "a plurality of BCN modems comprising a plurality of controllers;"

Grube discloses or renders obvious [34b]. DISH-1003, ¶¶149-155.

First, the "plurality of BCN modems" perform the same functions as the "plurality of receiving nodes" in Claim 29. *Compare* DISH-1001, Claim 29, *with id.*, Claim 34. Grube therefore discloses or renders obvious a plurality of BCN

modems because Grube discloses or renders obvious a plurality of receiving nodes. *See* §IV(A)(2)(a)[29b].

Grube further discloses a plurality of *modems* (each including a modulator and demodulator, DISH-1003, ¶¶150-152) that performs the same functions as the plurality of receiving nodes recited in Claim 29. Each of Grube's secondary sites includes "secondary DMT transmitter 124" and "secondary DMT receiver 122." DISH-1005, FIG. 8.



DISH-1005, Fig. 8.

The secondary DMT transmitter contains a DMT modulator (*see* DISH-1005, 43:55-57, FIG. 36) and the secondary DMT receiver contains a DMT demodulator (*see* DISH-1005, 4:10-13, FIG. 7). Thus, each of Grube's secondary sites, which contains both a modulator and a demodulator, functions as a modem. DISH-1003, ¶¶150-152.

Grube further discloses that the plurality of BCN modems comprise a plurality of controllers. DISH-1003, ¶¶153-154. Grube explains that each secondary site "include[s] a secondary site controller 120." DISH-1005, 8:29-32, FIG. 8 (red). The secondary site's controller in Grube is capable of executing the secondary site's functions. *Id.*, 12:42-44 ("Upon receiving the control information, the site controller 120 interprets the control information and determines whether an action is required by the secondary site"). A POSITA would have understood that each secondary site controller combined with the DMT transmitter and DMT receiver (each of claimed "controllers") would be able to fully execute the secondary site's (claimed each of "plurality of BCN modems") functions, including transmitting and receiving data.

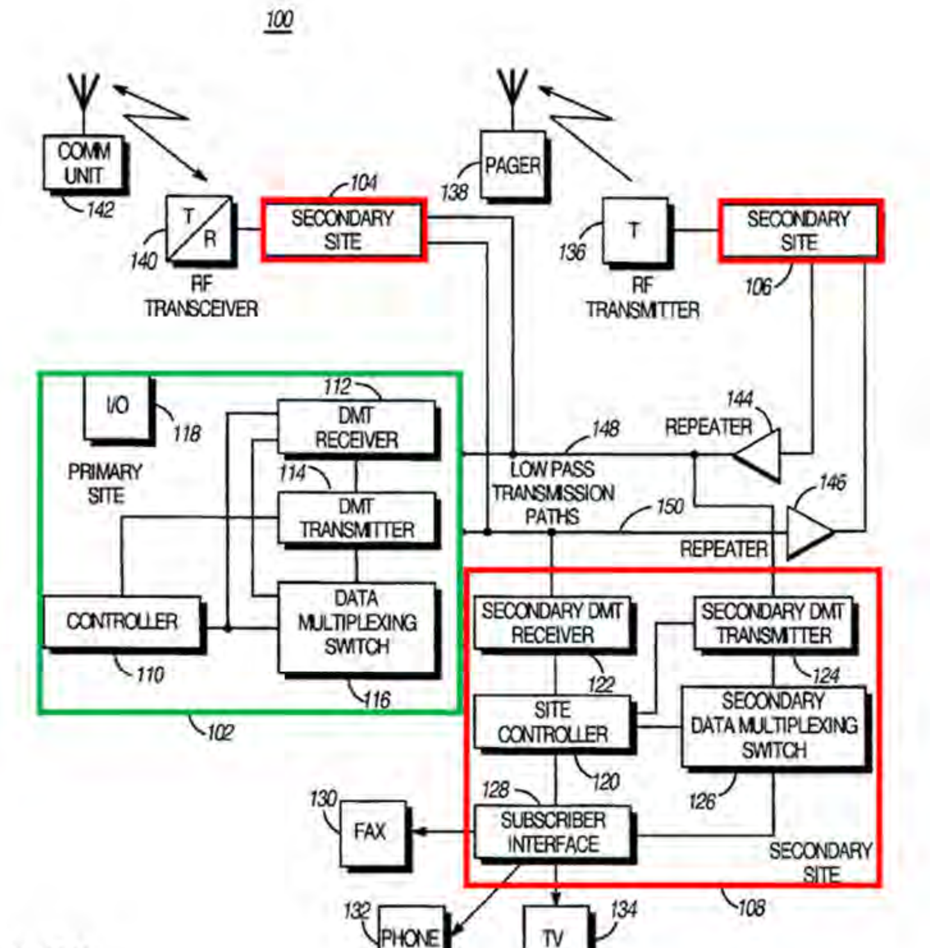


FIG.8

DISH-1005, Fig. 8.

[34c] "wherein the first controller is configured to transmit a probe signal to the plurality of controllers"

Grube discloses or renders obvious [34c]. DISH-1003, ¶¶156-158.

Grube discloses or renders obvious a first controller being configured to transmit a probe signal to the plurality of controllers. *See* §§IV(A)(2)(a)[29a], IV(A)(2)(b)[34a-34b].

[34d] "receive a plurality of response signals comprising a plurality of bit-loading modulation schemes from the plurality of controllers,"

Grube discloses or renders obvious [34d]. DISH-1003, ¶¶159-161.

Grube discloses or renders obvious a first controller receiving a plurality of response signals comprising a plurality of bit-loading modulation schemes from the plurality of controllers. *See* §§IV(A)(2)(a)[29b], IV(A)(2)(b)[34a-34b].

[34e] "wherein each of the plurality of controllers is configured to receive the probe signal through a corresponding channel path,"

Grube discloses or renders obvious [34e]. DISH-1003, ¶¶162-164.

Grube discloses or renders obvious each of the plurality of controllers being configured to receive a probe signal through a corresponding channel path. *See* §§IV(A)(2)(a)[29c], IV(A)(2)(b)[34a-34b].

[34f] "determine transmission characteristics of the corresponding channel path,"

Grube discloses or renders obvious [34f]. DISH-1003, ¶¶165-167.

Grube discloses or renders obvious each of the plurality of controllers being configured to determine transmission characteristics of the corresponding channel path. *See* §§IV(A)(2)(a)[29d], IV(A)(2)(b)[34a-34b].

[34g] "determine a bit-loading modulation scheme for the corresponding channel path based on the transmission characteristics, and"

Grube discloses or renders obvious [34g]. DISH-1003, ¶¶168-170.

Grube discloses or renders obvious each of the plurality of controllers being configured to determine a bit-loading modulation scheme for the corresponding channel path based on the transmission characteristics. *See* §§IV(A)(2)(a)[29e], IV(A)(2)(b)[34a-34b].

[34h] "transmit a response signal to the first controller informing the first controller of the bit-loading modulation scheme for the corresponding channel path,"

Grube discloses or renders obvious [34h]. DISH-1003, ¶¶171-173.

Grube discloses or renders obvious each of the plurality of controllers being configured to transmit a response signal to the first controller informing the first controller of the bit-loading modulation scheme for the channel path. *See* §§IV(A)(2)(a)[29f], IV(A)(2)(b)[34a-34b].

[34i] [wherein the first controller is configured to] "compare the plurality of bit-loading modulation schemes to determine a common bit-loading modulation scheme, and"

Grube discloses or renders obvious [34i]. DISH-1003, ¶¶174-176.

Grube discloses or renders obvious the first controller comparing the plurality of bit-loading modulation schemes to determine a common bit-loading modulation scheme. *See* §§IV(A)(2)(a)[29g], IV(A)(2)(b)[34a-34b].

[34j] [wherein the first controller is configured to] "transmit a broadcast signal relaying the common bit-loading modulation scheme to the plurality of controllers."

Grube renders obvious [34j]. DISH-1003, ¶¶177-179.

Grube renders obvious the first controller transmitting a broadcast signal relaying the common bit-loading modulation scheme to the plurality of controllers. *See* §§IV(A)(2)(a)[29h], IV(A)(2)(b)[29a-29b].

(c) Claim 30

[30] "… wherein the broadcast signal comprises handshake data."

Grube renders obvious Claim 30. DISH-1003, ¶¶180-184.

A POSITA would have understood that a handshake between two nodes involves back-and-forth data transmission between the two nodes. DISH-1003, ¶¶181-182. Grube discloses the transmission of a response signal comprising a bit-loading modulation scheme from each secondary site to the primary site. *See* §IV(A)(2)(c)[29f]. Grube further renders obvious the transmission of a broadcast signal relaying the common bit-loading modulation scheme from the primary site to the plurality of secondary sites in response to the transmission of the response signals. *See* §IV(A)(2)(c)[29g]. Grube thus renders obvious back-and-forth transmissions between the primary site and the secondary sites (claimed "handshake data").

A POSITA would have been motivated to include handshake functionality in

Grube because it would allow the devices participating in the handshake to establish protocols of a communication link at the start of the communications process. DISH-1003, ¶183. This creates a more efficient system because it establishes rules for one when device can communicate with another. *Id*. A POSITA would have experienced a reasonable expectation of success in implementing this functionality because it would've been nothing more than the combination of prior art elements (handshaking and Grube's communication system) according to known methods (handshaking in network communications systems) to yield predictable results. *Id*.

(d) Claim 31

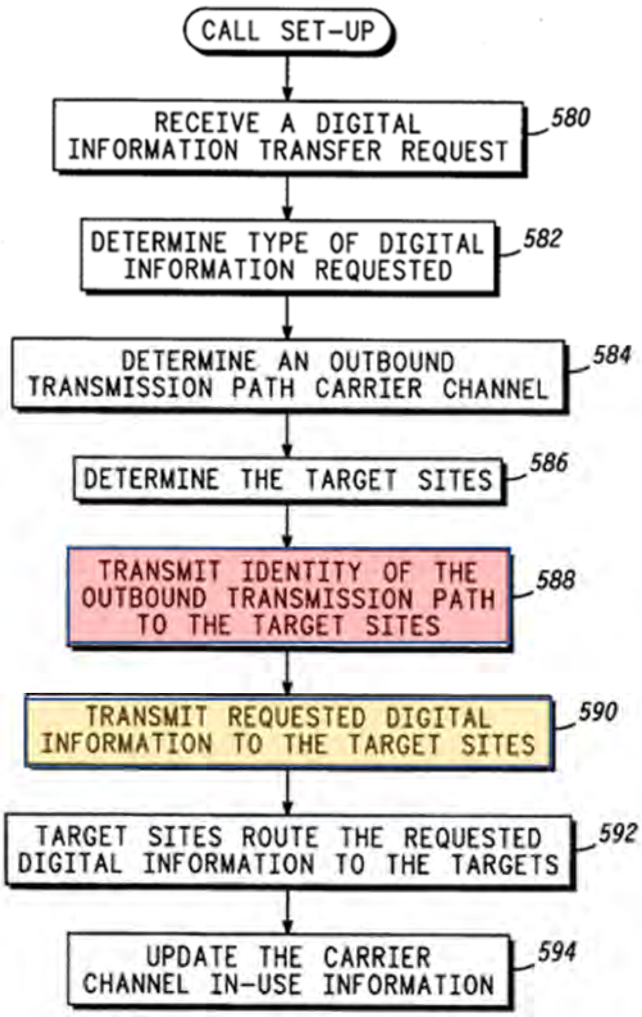
[31] "… wherein the broadcast signal is a communication message comprising video data, music data, or voice data."

Grube renders obvious claim 31. DISH-1003, ¶¶185-190.

Grube renders obvious its primary site transmitting a broadcast packet relaying the common bit-loading scheme. *See* §IV(A)(2)(a)[29h].

To the extent that Patent Owner asserts Claim 31 requires the same broadcast signal include the common bit-loading modulation scheme and video/music/voice data, Grube also discloses that "the primary site transmits, via the outbound transmission path, [] requested digital information to the [secondary sites]." DISH-1005, 29:45-48, FIG. 25 (yellow, below). For the "requested digital information," Grube clarifies that its communication system may be used to support various forms

of "data transfer," including "a video data transfer, an audio data transfer, … , a plain old telephone service (POTS) call, … , and other digital information transfers." DISH-1005, 23:54-60; *see id.*, 30:52-54 (noting Grube's system supports "transfer of digital audio [or] digital video").



DISH-1005, Fig. 25.

Accordingly, a POSITA would have been motivated to transmit the claimed "common bit-loading modulation scheme" and the requested digital information

(*e.g.*, audio/video data (claimed "voice data" or "video data")) in the same transmission (claimed "broadcast signal") to improve the efficiency in Grube. DISH-1003, ¶¶186-188. This transmission to increase efficiency would also be compatible with Grube, because Grube seeks to provide "highly reliable service," and because, per Grube's Figure 25 (above), no action is required on the part of Grube's secondary sites between receiving the claimed "common bit-loading modulation scheme" (red) and receiving a subsequent transmission of digital information (yellow). *Id.*, ¶188; DISH-1005, 4:24-28, FIG. 15.

A POSITA would have experienced a reasonable expectation of success in implementing this functionality—it would have been nothing more than the combination of prior art elements (transmission of video/music/voice data or transmission of a modulation scheme in a communication system) according to known methods (methods for transmitting media packets in networks) to yield predictable results (transmission of video/music/voice data and a modulation scheme in a communication system). DISH-1003, ¶189. Grube thus renders obvious the claimed "broadcast signal" also including "video data, music data, or voice data." DISH-1003, ¶¶185-190.

(e) Claim 35

[35] "… wherein the broadcast signal comprises handshake data."

Grube renders obvious Claim 35. DISH-1003, ¶¶191-193.

Grube renders obvious the broadcast signal comprising handshake data. *See* §IV(A)(2)(c)[30].

(f) Claim 36

[36] "… wherein the broadcast signal is a communication message comprising video data, music data, or voice data."

Grube renders obvious Claim 36. DISH-1003, ¶¶194-196.

Grube renders obvious the broadcast signal being a communication message comprising video data, music data, or voice data. *See* §IV(A)(2)(d)[31].

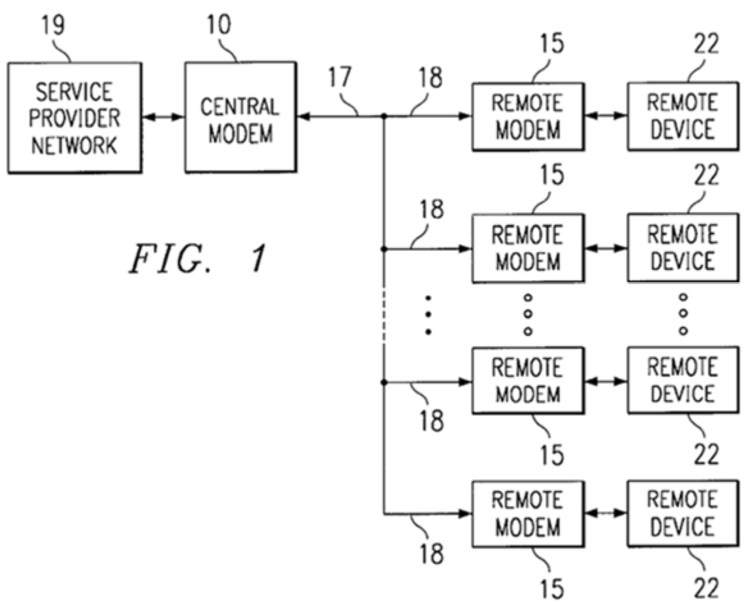
B. GROUND 2: Claims 29-31, 34-36 are Rendered Obvious by Grube and Cioffi

1. Overview of Cioffi

Cioffi describes "bi-directional data transmission systems that facilitate communications between a plurality of remote units and a central unit using a frame based discrete [DMT] multi-carrier transmission scheme." DISH-1006, 3:1-4; DISH-1003, ¶¶197-202. The DMT transmission scheme can be used in "applications well beyond data transmissions over telephone lines," including "cable based subscriber systems (which typically use coaxial cable)." DISH-1006, 2:5-11. Indeed, Cioffi explicitly recognizes that a transmission scheme for a "typical multiuser subscriber network" having a "central unit 10 (which includes a central modem) [that] communicates with a plurality of remote units over a common

transmission line 17 which is split into a plurality of feeds 18" can use a "variety of transmission media" including "twisted pair phone lines" and "coaxial cables." *Id.*, 7:21-40. Cioffi's network further supports the use of broadband signals. *See id.*, 3:63-65 ("When a remote unit is being Initialized, it transmits a broad-band initialization signal to the central unit during a synchronized quiet time.").

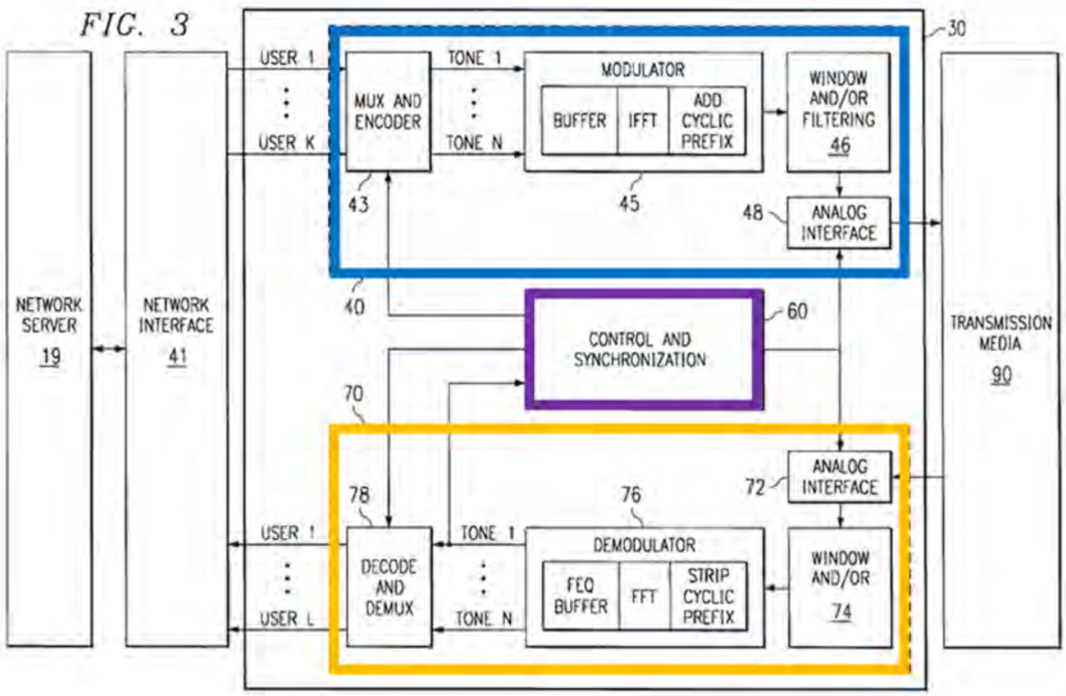
Cioffi's communications network infrastructure, depicted in Figure 1, could be a coaxial cable network or a twisted pair telephone line network (like Grube's). DISH-1006, FIG. 1, 7:37-41.



DISH-1006, Fig. 1.

Cioffi's "central modem 30" comprises a "transmitter 40" (blue), a "receiver 70" (yellow), and a "controller 60" (purple). DISH-1006, 24:66-25:2, FIG. 3. The

"transmitter 40 incorporates several components including … a discrete multi-tone modulator 45," and the "receiver 70 includes … a demodulator 76." *Id.*, 25:12-14, 26:16-19.

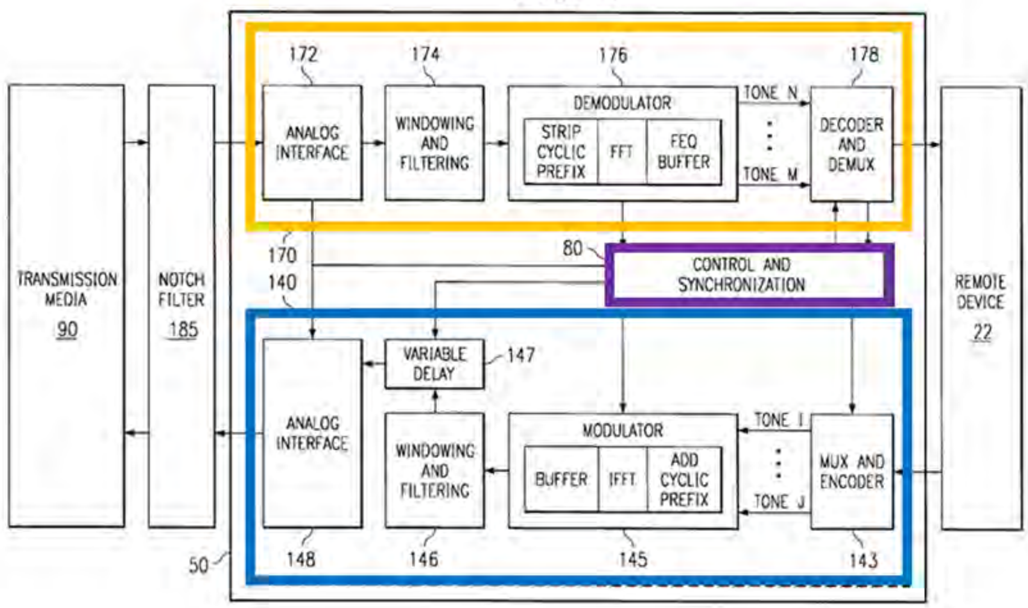


DISH-1006, Fig. 3.

Cioffi's "remote modem 50" comprises a component labeled "140" (blue), a component labeled "170" (yellow), and a "remote synchronization controller" (purple). DISH-1006, 9:60-61, FIG. 4. Although component 140 is not explicitly labeled in Cioffi, a POSITA would have understood that component 140 refers to a transmitter at the "remote modem 50" because the components of component 140 are the same as the components in the transmitter 40 at the central modem 30. DISH-

1003, ¶201. Cioffi notes that the "remote modem 50 … include[s] … a multi-tone modulator 145" (which is located in component 140). DISH-1006, 27:4-5, FIG. 4. Similarly, Cioffi acknowledges that the "remote unit 50 includes … a demodulator 176." *Id.*, 26:45-48. While component 170 is not explicitly labeled in Cioffi, a POSITA would have understood that component 170 refers to a receiver at the "remote unit 50" because the components of component 170 are the same as the components in receiver 70 at the central modem 30. DISH-1003, ¶201. The "demodulator 176" is located in component 170. DISH-1006, FIG. 4.

FIG. 4



DISH-1006, Fig. 4.

2. Grube-Cioffi Combination

The Grube-Cioffi combination incorporates Cioffi's teachings about broadband coaxial networks into Grube's system and method for determining a common bit-loading modulation scheme DISH-1003, ¶¶203-216.

(a) Motivation to Combine Grube and Cioffi

As discussed in Ground 1, Grube teaches determining a common bit-loading modulation scheme in the context of a "primary site" having "a DMT transmitter" and a "DMT receiver," and a plurality of secondary sites, each having "a secondary DMT receiver" and "a secondary DMT transmitter," Grube's exemplary infrastructure for such a network is a "twisted pair telephone line." DISH-1005, 6:57-67.

The issue faced by the inventors of the '450 Patent was the need for "a [one-to-many communications] system that allows node devices ("CPEs") to communicate directly over the existing coaxial cable with its current architecture without the need to modify the home cable infrastructure." DISH-1001, 3:37-40. Similarly, as shown in Ground 1, Grube's teachings render obvious such a system in a home/building environment having twisted-pair telephone lines or coaxial cable networks. DISH-1003, ¶¶204-206 (explaining the transferability of methods applied in the context of twisted pair networks to coaxial cable networks due to the similarities between twisted pair networks and coaxial cable networks).

To the extent Patent Owner argues a POSITA would not have found it obvious to implement Grube's system and method in a broadband coaxial network, Cioffi establishes that such an implementation would have been obvious. *Id.*, ¶¶207-215.

Cioffi recognizes that "DMT transmission scheme[s] ha[ve] the potential for use in applications well beyond data transmissions over telephone lines," and "it can be used in a variety of other digital subscriber access systems as well," including "cable based subscriber systems (which typically use coaxial cable)." DISH-1006, 2:5-11; *see also id.*, 3:9-16 (recognizing applicability of DMT transmission schemes to both twisted pair telephone lines and coaxial cables). Cioffi further teaches the use of broadband signals in its coaxial cable network. *See, e.g., id.*, 3:63-65.

A POSITA would have thus been motivated to incorporate Cioffi's coaxial cable network infrastructure that supports the transmission of broadband signals into Grube's determination of a common bit-loading modulation scheme in the context of DMT transmission schemes. DISH-1003, ¶¶207-209. This is particularly so because DMT transmission schemes are preferred in existing cable systems because they are more efficient. *Id.*; *see, e.g.*, DISH-1006, 2:17-28 ("In some existing cable systems (which do not use discrete multi-tone transmission schemes), each remote unit is given a dedicated frequency band over which it is to communicate with the central station. However, such an approach is inherently an inefficient use of

transmission bandwidth and typically requires the use of analog filters to separate transmissions from the various remote units. Other existing cable systems use a single wide band for all remote units, which use time division multiple access (TDMA) to access the upstream channel. This approach is inefficient because of the lower total capacity of the single channel and because of the time required for the accessing process.").

Specific to Claims 34-38, a POSITA would further be motivated to incorporate the central modem and the remote modems in Cioffi into Grube's method. A POSITA would have been motivated to expand the applicability of Grube's method by incorporating Cioffi's broadband coaxial network into Grube's system and method. DISH-1003, ¶210.

Such a combination would have been obvious at least because it involves combining prior art elements (such as Cioffi's broadband coaxial network and Grube's adaptive bit-loading methods) according to known methods (applying Grube's adaptive bit-loading methods to a broadband coaxial network without modifications to Grube's methods) to yield predictable results (where the output LCD outbound control channel bit loading table remains the same regardless of whether the network is a broadband coaxial network or a twisted-pair telephone line network). *Id.*, ¶211.

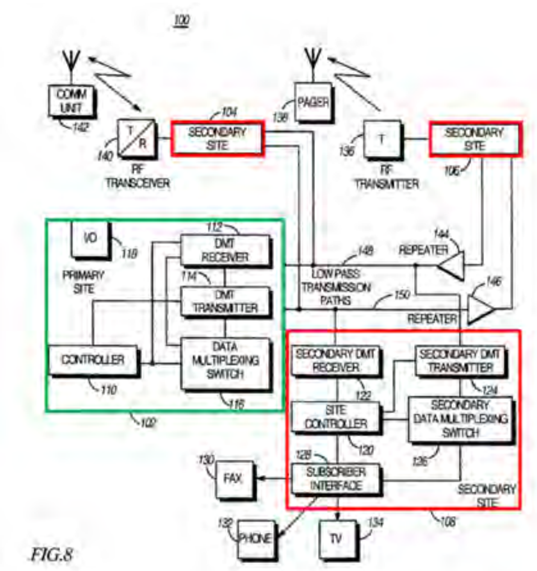
Additionally, such a combination would have been obvious at least because it involves the use of known techniques (such as Grube's method for determining a LCD outbound control channel bit loading table) to improve similar devices (such as Cioffi's broadband coaxial network) in the same way (where Grube's adaptive bit-loading method would perform the same functions in the context of a broadband coaxial network). *Id.*, ¶212.

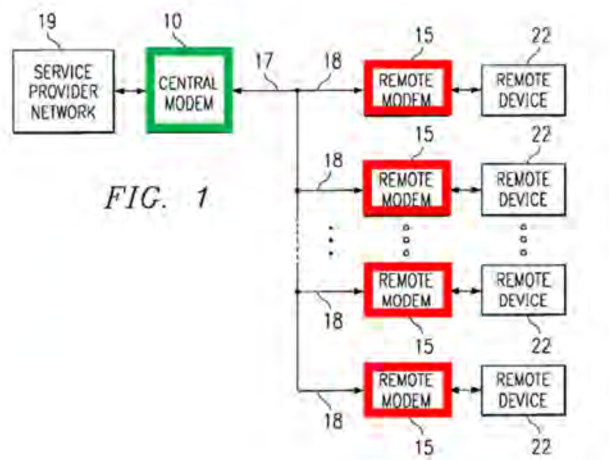
(b) Reasonable Expectation of Success

A POSITA would have had a reasonable expectation that the Grube-Cioffi combination would produce a successful outcome. DISH-1003, ¶¶213-216. This is particularly so because Grube and Cioffi are analogous art, so a combination of the two references would have been predictable. *See* §§IV(A)(1), IV(B)(1).

A POSITA would have found the implementation of Cioffi's network infrastructure to Grube's method to be a predictable and routine exercise to extend Grube's applicability to other types of communications networks beyond those disclosed in Grube, such as networks disclosed by Cioffi. DISH-1003, ¶214. Cioffi teaches that DMT transmission schemes are applicable to broadband coaxial networks. *See* DISH-1006, 2:5-11, 3:63-65. Such a combination would thus have been within the skill level of a POSITA because a POSITA would have simply implemented Cioffi's central modem as Grube's primary site, while retaining the

functionalities of Grube's primary site, and a POSITA would have further implemented Cioffi's remote modems as Grube's secondary sites (red), while retaining the functionalities of Grube's secondary sites. DISH-1003, ¶214.





DISH-1005, Fig. 8. DISH-1006, Fig. 1.

A POSITA would also expect the implementation of Cioffi's network to Grube's system and method to be successful because a POSITA would have understood that switching the link medium neither alters Grube's technique for determining a common bit-loading modulation scheme nor renders parts of Grube's method redundant. *Id.*, ¶215. In fact, Cioffi recognizes that its infrastructure in Figure 1 can use either twisted pair telephone lines or coaxial cables in a broadband network, thus emphasizing the interchangeability of the link medium. *Id.*; DISH-1006, 7:37-41. Accordingly, a POSITA would have experienced a reasonable

expectation of success in applying Cioffi's broadband coaxial network to Grube's technique for determining a common bit-loading modulation scheme, and a POSITA would have been motivated to make that combination to expand the applicability of Grube's system and method to other compatible communications networks. DISH-1003, ¶215.

3. Claims 29, 31, 34, 36

(a) Claim 29

Grube-Cioffi renders obvious Claim 29. *Id.*, ¶¶217-223.

Grube renders obvious Claim 29 (*see* §IV(A)(2)(a)). Features [29pre]-[29h] are rendered obvious for at least the same reasons noted regarding Ground 1. Limitation [29pre] is also supported by Cioffi.

[29pre] "A broadcasting method within a Broadband Coaxial Network ("BCN"), comprising:"

To the extent the preamble is limiting, Grube-Cioffi renders obvious [29pre]. DISH-1003, ¶¶218-223.

The Grube-Cioffi combination further renders obvious [29pre]. *Id.* Cioffi[6]

[6] Like Grube (*see* §IV(A)(2)[29pre]), Cioffi is analogous art to the '450 Patent because both are from the same field of endeavor (communication network

teaches the use of DMT transmission schemes in broadband coaxial networks. DISH-1003, ¶¶219-220.

Cioffi recognizes that the "discrete multi-tone (DMT) transmission scheme has the potential for use in applications well beyond data transmissions over telephone lines," including "cable based subscriber systems (which typically use coaxial cable)." DISH-1006, 2:5-11.

Cioffi further discloses the use of broadband signals in its coaxial cable network. *See, e.g., id.*, 3:63-65 ("When a remote unit is being initialized, it transmits a broad-band initialization signal to the central unit during a synchronized quiet time."). Thus, Cioffi discloses a broadband coaxial network. DISH-1003, ¶221. As explained above, and in light of the motivation to combine Grube and Cioffi, the Grube-Cioffi combination renders obvious a broadcasting method within a broadband coaxial network. *Id.*, ¶¶218-223.

---

infrastructures involving one-to-many communications) and because Cioffi is pertinent to the problems that the '450 Patent is concerned with (increasing the efficiency of the use of transmission channels in one-to-many communications networks). DISH-1003, ¶202; DISH-1001, 3:65-67, 16:4-8; DISH-1006, 1:16-20, 2:57-58.

As shown in Ground 1, Grube discloses or renders obvious limitations [29pre]-[29h]. For those same reasons, Grube-Cioffi therefore renders obvious [29pre]-[29h].

(b) Claim 34

Grube-Cioffi renders obvious Claim 34. DISH-1003, ¶¶224-244.

Grube renders obvious Claim 34 (*see* §IV(A)(2)(b)). Features [34pre]-[34j] are rendered obvious for at least the same reasons noted regarding Ground 1. Limitations [34pre], [34a], and [34b] are also supported by Cioffi.

[34pre] "A Broadband Coaxial Network ("BCN") comprising"

To the extent the preamble is limiting, Grube-Cioffi renders obvious [34pre]. *Id.*, ¶¶225-227.

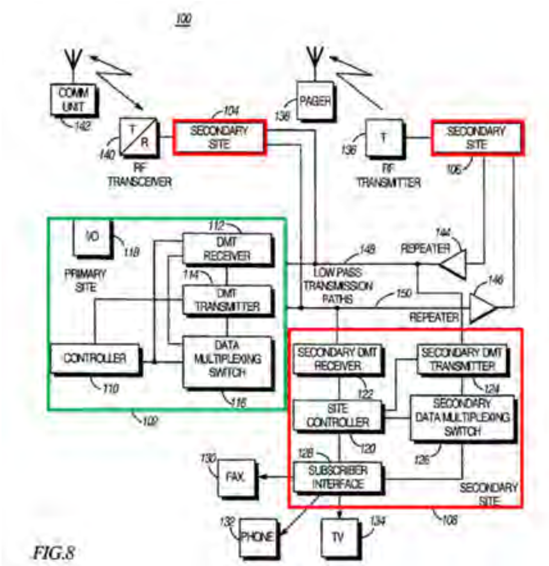
See §IV(B)(3)(a)[29pre], which shows Grube-Cioffi renders obvious a broadband coaxial network.

[34a] "a first BCN modem comprising a first controller; and"

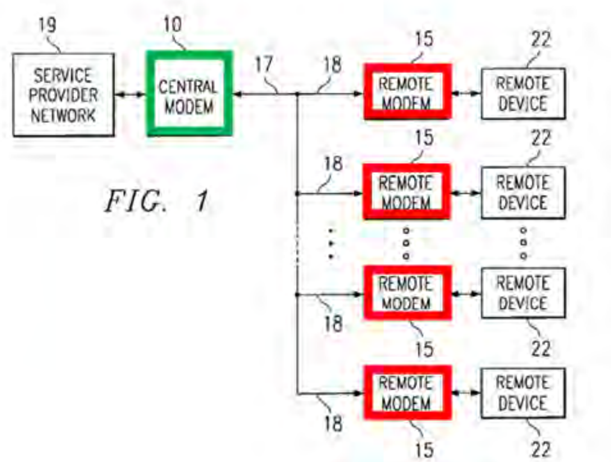
Grube-Cioffi renders obvious [34a]. *Id.*, ¶¶228-235.

In addition to Grube's teachings (*see* §IV(A)(2)(b)[34a]), to the extent that Patent Owner asserts Grube does not explicitly disclose that the first modem is a BCN modem comprising a first controller, Cioffi further discloses or renders obvious the first modem being "a first BCN modem comprising a first controller."

The coaxial cable network depicted in Cioffi's Figure 1 can be easily substituted into the communications network infrastructure of Grube. *See* §IV(B)(2). This is particularly so since Cioffi explicitly recognizes that the communications network infrastructure of Figure 1 could be either a coaxial cable network or a twisted pair telephone line communications network (like in Grube). DISH-1006, 7:37-41.



DISH-1005, Fig. 8.



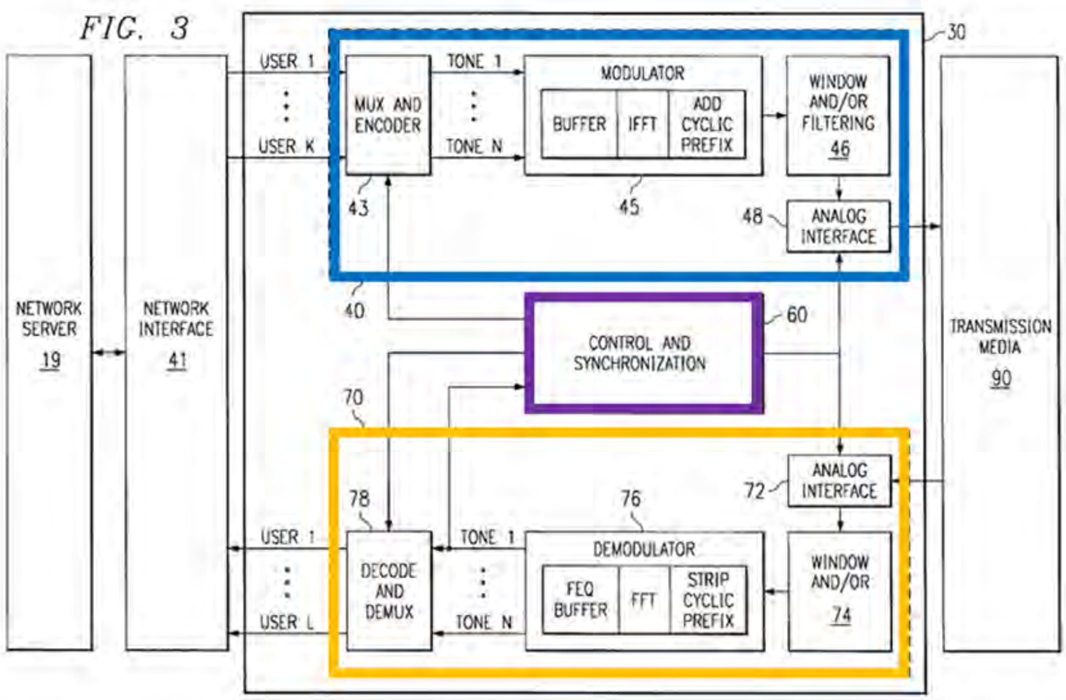
DISH-1006, Fig. 1.

It would therefore have been obvious to a POSITA to replace Grube's primary site with Cioffi's "central modem," which is part of a coaxial cable network that supports broadband signal tranmissions. DISH-1003, ¶¶228-231.

Cioffi's "central modem" (claimed "first BCN modem") includes "central modem 30" that comprises a "transmitter 40" (blue), a "receiver 70" (yellow), and a

"controller 60" (purple). DISH-1006, 24:67-25:2, FIG. 3. Cioffi notes that the "transmitter 40 incorporates several components including … a discrete multi-tone modulator 45." *Id.*, 25:12-14. Similarly, Cioffi acknowledges that the "receiver 70 includes … a demodulator 76." *Id.*, 26:16-19; *see* §IV(A)(2)(b)[34a]-[34b] (explaining that a modem comprises at least a modulator and a demodulator).

Cioffi's "central modem" thus comprises a modulator and a demodulator and functions like the "transmitting node" in Claim 29.



DISH-1006, Fig. 3.

Further, as noted in Grube, although Cioffi's modem includes a "controller 60," a POSITA would have understood that the controller combined with the

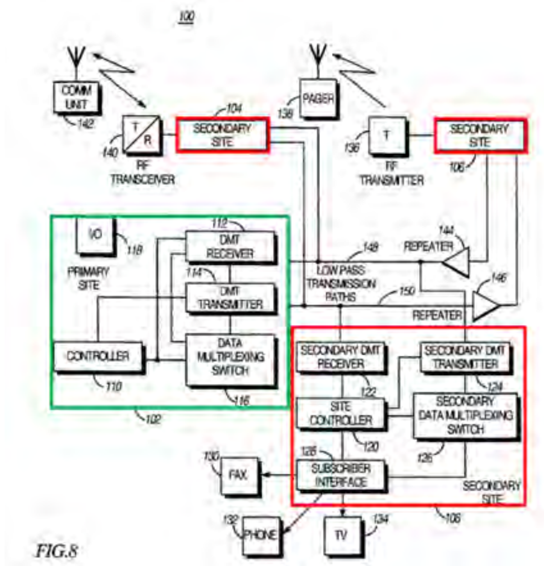
transmitter and the receiver (claimed "first controller") would be able to fully execute the central modem's (claimed "first BCN modem") functions, including transmitting and receiving data. DISH-1003, ¶¶232-234; *see also* DISH-1006, 10:15-17 (the "controller 60 … generates a downstream synchronization signal that is transmitted back to the remote units," which necessitates the involvement of a transmitter to perform the actual transmission of the synchronization signal).

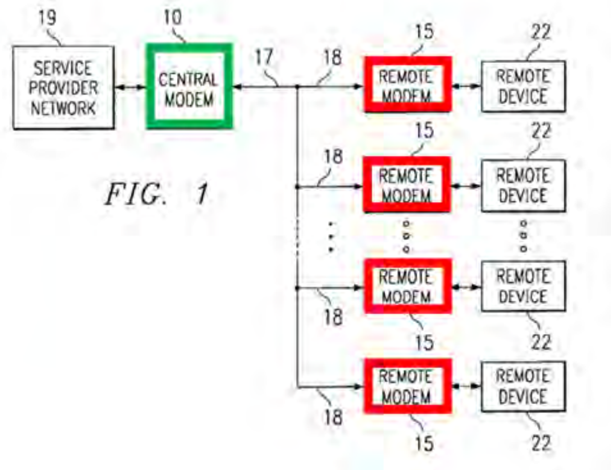
[34b] "a plurality of BCN modems comprising a plurality of controllers;"

Grube-Cioffi renders obvious [34b]. DISH-1003, ¶¶236-244.

In addition to Grube's teachings (*see* §IV(A)(2)(b)[34b]), to the extent that Patent Owner asserts Grube does not explicitly disclose that the plurality of modems are BCN modems comprising a plurality of controllers, Cioffi further discloses or renders obvious the plurality of modems being BCN modems comprising a plurality of controllers.

The coaxial cable network depicted in Cioffi's Figure 1 can be easily substituted into the communications network infrastructure of Grube, replacing the existing cabling. *See* §IV(B)(2). This is particularly so since Cioffi explicitly recognizes that the communications network infrastructure of Figure 1—in which Cioffi's system may be implemented—could be either a coaxial cable network or a twisted pair telephone line network (like in Grube). DISH-1006, 7:37-41.





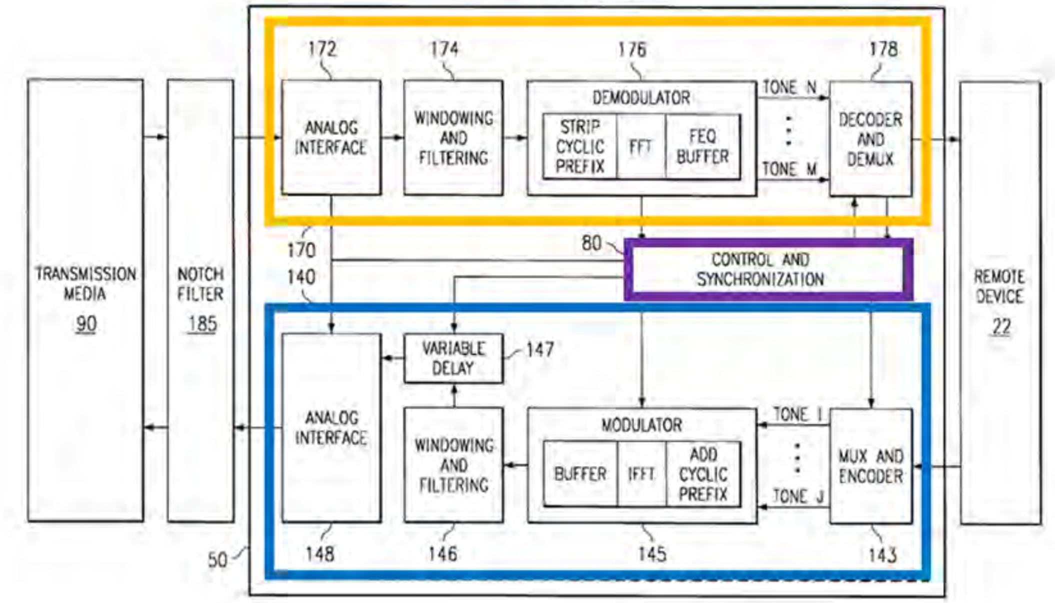
DISH-1005, Fig. 8. DISH-1006, Fig. 1.

It would therefore have been obvious to a POSITA to replace each of Grube's secondary sites with Cioffi's "remote modem," which is part of a coaxial cable network that supports broadband signal tranmissions. DISH-1003, ¶¶237-239.

Cioffi's "remote modem" (also known as a "remote unit") (claimed "plurality of modems") includes "remote unit 50" that comprises a component "140" (blue), a component "170" (yellow), and a "remote synchronization controller" (purple). DISH-1006, 9:60-61, FIG. 4. Although component 140 in Cioffi is not explicitly labeled in the specification, a POSITA would have understood that component 140 refers to a transmitter at the "remote unit 50" because the components of component 140 are the same as the components in the transmitter 40 at the central modem 30. *Id.*, ¶240. Cioffi notes that the "remote modem 50 … include[s] … a multi-tone

modulator 145" (which is located in component 140). *Id.*, 27:4-5, FIG. 4. Similarly, Cioffi acknowledges that the "remote unit 50 includes … a demodulator 176." *Id.*, 26:45-48; *see* §IV(A)(2)(b)[34a]-[34b] (explaining that a modem comprises at least a modulator and a demodulator). While component 170 is not explicitly labeled in the specification, a POSITA would have understood that component 170 refers to a receiver at the "remote unit 50." DISH-1003, ¶240. This is because the components of component 170 are the same as the components in receiver 70 at the central modem 30. *Id*. The "demodulator 176" is located in component 170. DISH-1006, FIG. 4.

Cioffi's "remote modem" thus comprising a modulator and a demodulator and functions like each "receiving node" in Claim 29.



DISH-1006, Fig. 4.

Further, as noted in Grube, although Cioffi's modem includes a "remote synchronization controller 80," a POSITA would have understood that the controller combined with components 140 (transmitter) and 170 (receiver) in the remote modem (each of claimed "plurality of controllers") would be able to fully execute each remote modem's (each of claimed "plurality of BCN modems") functions, including transmitting and receiving data. DISH-1003, ¶¶241-242; *see also* DISH-1006, 10:15-17 (the "controller 60 … generates a downstream synchronization signal that is transmitted back to the remote units," which necessitates the involvement of a transmitter to perform the actual transmission of the synchronization signal).

As shown in Ground 1, Grube discloses or renders obvious limitations [34pre]-[34j]. For those same reasons, Grube-Cioffi therefore renders obvious [34pre]-[34j].

(c) Claim 30

[30] "… wherein the broadcast signal comprises handshake data."

Grube-Cioffi renders obvious Claim 30. DISH-1003, ¶¶245-247.

As shown in Ground 1, Grube renders obvious Claim 30. *See* §IV(A)(2)(c)[30]. For those same reasons, Grube-Cioffi renders obvious Claim 30. *Id.*

(d) Claim 31

[31] "… wherein the broadcast signal is a communication message comprising video data, music data, or voice data."

Grube-Cioffi renders obvious Claim 31. DISH-1003, ¶¶248-250.

As shown in Ground 1, Grube renders obvious Claim 31. *See* §IV(A)(2)(d)[31]. For those same reasons, Grube-Cioffi renders obvious Claim 31. *Id.*

(e) Claim 35

[35] "… wherein the broadcast signal comprises handshake data."

Grube-Cioffi renders obvious Claim 35. DISH-1003, ¶¶251-253.

As shown in Ground 1, Grube renders obvious Claim 35. *See*

§IV(A)(2)(e)[35]. For those same reasons, Grube-Cioffi renders obvious Claim 35. *Id.*

(f) Claim 36

[36] "… wherein the broadcast signal is a communication message comprising video data, music data, or voice data."

Grube-Cioffi renders obvious Claim 36. DISH-1003, ¶¶254-256.

As shown in Ground 1, Grube renders obvious Claim 36. *See* §IV(A)(2)(f)[36]. For those same reasons, Grube-Cioffi renders obvious Claim 36. *Id.*

C. GROUNDS 3A-B: Claims 29-38 are Rendered Obvious by Grube and Matsumoto, or Grube and Cioffi and Matsumoto

1. Matsumoto Overview

Matsumoto discloses "a communication method which realizes data communication through the existing power lines by using a method such as the DMT (Discrete [Multi] Tone) modem system." DISH-1007, 1:9-12; DISH-1003, ¶¶257-263. Matsumoto further state that its "[multi]-carrier modem system" is applicable to "any communication device for carrying out cable communication." DISH-1007, 1:17-21. Matsumoto recognizes that synchronization can be difficult in "N to N communications," and seeks to provide a "communication device, which, by using a multi-carrier modem system, makes it possible … to readily achieve a N-to-N high-speed communication." *Id.*, 3:21-4:5.

Matsumoto discloses a "communication device serving as a virtual master" that "carries out training on all the other communication devices." DISH-1007, 23:4-6. The "virtual master" compares the "training results" from each of the "slave devices" to determine the "common tones that can be used among the communication devices and the common number of bits that can be used for the tones." *Id.*, 23:9-25. For example, for tones 1 and 2, the training results from the "first slave device" indicate zero bits for tone 1 and eight bits for tone 2, while the training results from the "second slave device" indicate five bits for tone 1 and ten bits for tone 2, and the training results from the "third slave device" indicate eight bits for tone 1 and ten bits for tone 2. *Id.* Across the three "slave device[s]," the lowest number of bits for tone 1 is zero and the lowest number of bits for tone 2 is eight. *Id.* Accordingly, tone 1 is determined to be unusable, and the common number of bits to be used for tone 2 is eight. *Id.* The "commonly-used carrier among the communication devices and the commonly-used number of bits that can be assigned to each carrier" is known as "mapping information. *Id.*, 6:24-7:3. Matsumoto provides the "mapping information" to "all the communication devices simultaneously" to allow said devices to operate "based upon the mapping information." *Id.*, 5:9-14.

Matsumoto additionally recognizes that the "communication devices

connected to the transmission path … to operate [as] either a virtual master or a slave." *Id.*, 25:1-3. This enables the communication network in Matsumoto to support "N-to-N communications." *Id*, 25:6-7.

2. Grube(-Cioffi)-Matsumoto Combinations

The Grube(-Cioffi)-Matsumoto [7] combinations incorporate Matsumoto's techniques for providing "mapping information" to "all the communication devices" simultaneously and for enabling each network node to determine its own "mapping information" into Grube(-Cioffi)'s method for determining a common bit-loading modulation scheme in coaxial cable networks. DISH-1003, ¶¶264-280.

(a) Motivation

Grube(-Cioffi) presents a method for determining a common bit-loading modulation scheme to facilitate data transmissions from Grube's primary site (or Cioffi's central modem) to Grube's plurality of secondary sites (or Cioffi's remote modems). DISH-1005, 6:57-67. To the extent that Patent Owner asserts that Grube(-Cioffi) does not render obvious the transmission of the claimed "common bit-loading modulation scheme," a POSITA would have been motivated to look to another reference, like Matsumoto, to determine how Grube's secondary sites (or

---

[7] This section discusses Grube and Grube-Cioffi, both combined with Matsumoto, using the shorthand Grube(-Cioffi).

Cioffi's remote modems) would learn of the "LCD outbound control channel bit loading table" from Grube to enable effective data transmissions. DISH-1003, ¶¶265-266.

Matsumoto recognizes that "mapping information" may be provided to "all the communication devices simultaneously" to allow said devices to operate "based upon the mapping information." DISH-1007, 5:9-14. Like Grube's "LCD outbound control channel bit loading table," the "mapping information" also contains the commonly-used number of bits assigned to each carrier channel. DISH-1003, ¶267. A POSITA would have thus been motivated to incorporate this disclosure in Matsumoto into Grube(-Cioffi) to render obvious the simultaneous transmission of the "LCD outbound control channel bit loading table" in Grube(-Cioffi). *Id.* This is particularly so because a POSITA would have understood that Matsumoto's method of transmitting its "mapping information" to all the other communication devices simultaneously would ensure efficient use of the transmission channels by avoiding duplicative transmissions. *Id.*

A POSITA would thus have recognized the benefit of having increased connectivity between nodes. *Id.*, ¶268; DISH-1005, 4:22-24 (applicable to "one-to-many" communications); *see generally* DISH-1007 (applicable to N-to-N communications). This is particularly so, because technological advancements have

resulted in an increasing number of devices within a home/building environment. DISH-1003, ¶¶268-269. To further increase connectivity between nodes, a POSITA would have been motivated to expand Grube(-Cioffi)'s method and system to include many-to-many communications. *Id*.

A POSITA would therefore have been motivated to implement Matsumoto's teachings that a communication device can operate as a "virtual master or a slave" into Grube(-Cioffi)'s method to enable N-to-N communications in the context of Grube(-Cioffi). *Id.*, ¶¶269-271; DISH-1007, 25:1-3. Configuring Grube's sites (or Cioffi's modems) to each be able to determine a common bit-loading modulation scheme would allow each site to transmit data to other nodes in the network, thus enhancing connectivity within the network. DISH-1003, ¶¶269-271.

Such a combination would have been obvious at least because it involves combining prior art elements (such as the nodes in Matsumoto that can switch between being a "virtual master" or a "slave", and Matsumoto's disclosure of transmitting "mapping information" to all other nodes simultaneously and Grube(-Cioffi)'s method for determining an LCD outbound control channel bit loading table) according to known methods (applying Grube(-Cioffi)'s method to each node in Matsumoto's network with no modifications to Grube(-Cioffi)'s method) to yield predictable results (an N-to-N communication system where each node determines

a respective common bit-loading modulation scheme and transmits the LCD outbound control channel bit loading table to other nodes). *Id.*, ¶272.

Additionally, such a combination would have been obvious at least because it involves the use of known techniques (such as Grube(-Cioffi)'s) method for determining a LCD outbound control channel bit loading table and Matsumoto's disclosure that the nodes can switch between being a "virtual master" or a "slave," and where the nodes are configured to transmit "mapping information" to all other nodes in the network simultaneously) to improve similar devices (nodes in a communication network) in the same way (each node in a network is capable of N-to-N communications and determining a respective common bit-loading modulation scheme). *Id.*, ¶273.

(b) Reasonable Expectation of Success

A POSITA would have had a reasonable expectation that the Grube(-Cioffi)-Matsumoto combination would produce a successful outcome. DISH-1003, ¶¶274-280. This is particularly so because Grube, Cioffi, and Matsumoto are analogous art, so a combination of the references would have been predictable. *See*, §§IV(A)(1), IV(B)(1), IV(C)(1).

A POSITA would thus have found the implementation of Matsumoto's simultaneous transmission of mapping information to Grube(-Cioffi)'s method to be

a predictable and routine exercise to clarify how Grube's secondary sites (or Cioffi's remote modems) learn of the claimed "common bit-loading modulation scheme," which is not explicitly disclosed in Grube or Cioffi. DISH-1003, ¶¶275-276. Such a combination would thus have been within the skill level of a POSITA because a POSITA would have simply transmitted the common bit-loading modulation scheme simultaneously to Grube's secondary sites (or Cioffi's remote modems) without changing any principles of operation in Grube(-Cioffi)'s system or method. *Id*.

A POSITA would have also expected the implementation of Matsumoto's disclosure of simultaneous transmission of mapping information to all other communication devices in Grube(-Cioffi)'s system and method to be successful because such an implementation neither alters Grube(-Cioffi)'s technique for determining a common bit-loading modulation scheme nor renders parts of Grube(-Cioffi)'s method redundant. *Id.*, ¶277. Accordingly, a POSITA would have found applying Matsumoto's teachings to Grube(-Cioffi)'s technique for determining a common bit-loading modulation scheme to be an obvious choice with a reasonable expectation of success, and a POSITA would have been motivated to pursue that choice to ensure that data transmissions in Grube(-Cioffi) occur at an increased efficiency. *Id*.

Further, a POSITA would have implemented Matsumoto's communication devices' ability to operate as a "virtual master" or a "slave" in Grube(-Cioffi)'s system and method to be a predictable and routine exercise to ensure that each node in Grube(-Cioffi) is capable of at least temporarily taking on the role of Grube's primary site (or Cioffi's central modem) so as to increase connectivity within the network. *Id.*, ¶278. Such a combination would have been within the skill level of a POSITA because a POSITA would have replicated Grube(-Cioffi)'s system and method to each node in the Grube(-Cioffi) network, such that each of Grube's sites (or Cioffi's modems) is configured to be capable of performing the functions of the Grube's primary site (or Cioffi's central modem). *Id*.

Further, specific to Claims 34-38, Grube's secondary sites (or Cioffi's remote modems) further comprise the same components as Grube's primary site (or Cioffi's central modem) that allow Grube's primary site (or Cioffi's central modem) to perform its claimed functions, thus enabling Grube's secondary sites (or Cioffi's remote modems) to be capable of performing the functions of Grube's primary site (or Cioffi's central modem). *Id,* ¶279.

A POSITA would have also expected the implementation of Matsumoto's teaching that each communication device can operate as a "virtual master or a slave" to be successful because a POSITA would have understood that applying Grube(-

Cioffi)'s system and method to each node in a network neither alters Grube(-Cioffi)'s technique for determining a common bit-loading modulation scheme nor renders parts of Grube(-Cioffi)'s method redundant. *Id.*, ¶280. Accordingly, a POSITA would have found this extension of Grube(-Cioffi)'s system and method to each node in the network to be an obvious choice with a reasonable expectation of success, and a POSITA would have been motivated to pursue that choice to increase network connectivity. *Id.*

3. Claims 29-38

(a) Claim 29

Grube(-Cioffi)-Matsumoto renders obvious Claim 29. *Id.*, ¶¶281-289.

Grube(-Cioffi) render obvious Claim 29 (*see* §§IV(A)(2)(a), IV(B)(3)(a)). Features [29pre]-[29h] are rendered obvious for at least the same reasons noted regarding Grounds 1 and 2. Limitation [29h] is also supported by Matsumoto.

[29h] "the transmitting node transmitting a broadcast signal relaying the common bit-loading modulation scheme to the plurality of receiving nodes."

Grube(-Cioffi)-Matsumoto renders obvious [29h]. DISH-1003, ¶¶282-289.

In addition to Grube(-Cioffi)'s teachings (*see* §§IV(A)(2)(a)[29g], IV(B)(3)(a)[29g]), to the extent that Patent Owner asserts Grube(-Cioffi) does not explicitly disclose the transmission of a broadcast signal relaying the common bit-

loading modulation scheme, Matsumoto[8] further discloses the transmission of a broadcast signal relaying a "common bit-loading modulation scheme." *See* DISH-1007, 5:9-14.

Matsumoto states that a "communication device serving as a virtual master" carries out training on all the other communication devices." DISH-1007, 23:4-6; DISH-1003, ¶¶283-285 (explaining why Matsumoto's "tones" are like Grube's "channels").

The "virtual master" compares the "training results" from each of the "slave devices" to determine the "common tones that can be used among the communication devices and the common number of bits that can be used for the tones." DISH-1007, 23:11-13. For example, the training results from the "first slave

[8] Like Grube and Cioffi, Matsumoto is analogous art to the '450 Patent because both are from the same field of endeavor (communication network infrastructures capable of one-to-many communications) and because Matsumoto is reasonably pertinent to the problems that the '450 Patent is concerned with (i.e., enabling the potential for one-to-many communications in a network using existing wired communications infrastructure). DISH-1003, ¶¶262-263; DISH-1001, 4:12-13, 3:37-40; DISH-1007, 1:25-2:8, 4:4-7; *see* §§IV(A)(2)(a)[29pre], (B)(3)(a)[29pre].

device" indicate zero bits for tone 1, eight bits for tone 2, nine bits for tone 3, and ten bits for tone 4, while the training results from the "second slave device" indicate five bits for tone 1, ten bits for tone 2, nine bits for tone 3, and seven bits for tone 4, and the training results from the "third slave device" indicate eight bits for tone 1, ten bits for tone 2, six bits for tone 3, and eight bits for tone 4. *Id.*, 23:14-25. Across the three "slave device[s]," the lowest number of bits for tone 1 is zero, the lowest number of bits for tone 2 is eight, the lowest number of bits for tone 3 is six, and the lowest number of bits for tone 4 is seven. *Id*. As such, tone 1 is determined to be unusable, and the common number of bits to be used for tones 2, 3, and 4 are eight, six, and seven respectively. *Id*. The "commonly-used carrier among the communication devices and the commonly-used number of bits that can be assigned to each carrier" is known as "mapping information." *Id.*, 6:24-7:3. Matsumoto's "mapping information" contains the same information as Grube(-Cioffi)'s "LCD outbound control channel bit loading table" (a listing of carrier channels and the corresponding number of bits allocated to each carrier channel), and, thus, as described above, a POSITA would have understood Matsumoto's "mapping information" to disclose a "bit-loading modulation scheme.". *See* §IV(C)(1-2).

Matsumoto then states that the "communication device serving as a virtual master simultaneously gives the mapping information thus determined to all the

communication devices." DISH-1007, 24:1-4. Grube(-Cioffi)-Matsumoto thus renders obvious the transmission of Grube(-Cioffi)'s "LCD outbound control channel bit loading table" to Grube's secondary sites (or Cioffi's remote modems). DISH-1003, ¶¶286-288

As shown in Grounds 1 and 2, Grube(-Cioffi) discloses or renders obvious limitations [29pre]-[29h]. For those same reasons, Grube(-Cioffi)-Matsumoto therefore renders obvious [29pre]-[29h].

(b) Claim 34

Grube(-Cioffi)-Matsumoto renders obvious Claim 34. DISH-1003, ¶¶290-294.

Grube(-Cioffi) renders obvious Claim 34 (*see* §§IV(A)(2)(b), IV(B)(3)(b)). Features [34pre]-[34j] are rendered obvious for at least the same reasons noted regarding Grounds 1 and 2. Limitation [34j] is also supported by Matsumoto.

[34j] "transmit a broadcast signal relaying the common bit-loading modulation scheme to the plurality of controllers."

Grube(-Cioffi)-Matsumoto render obvious [34j]. DISH-1003, ¶¶291-294.

Grube(-Cioffi)-Matsumoto renders obvious that a broadcast signal relaying the common bit-loading modulation scheme is transmitted to the plurality of controllers. *See* §IV(C)(3)(a)[29h].

As shown in Grounds 1 and 2, Grube(-Cioffi) discloses or renders obvious

limitations [34pre]-[34j]. For those same reasons, Grube(-Cioffi)-Matsumoto therefore renders obvious [34pre]-[34j].

(c) Claim 30

[30] "… wherein the broadcast signal comprises handshake data."

Grube(-Cioffi)-Matsumoto renders obvious Claim 30. DISH-1003, ¶¶295-298.

As shown in Ground 1, Grube renders obvious Claim 30. *See* §IV(A)(2)(c)[30]. For those same reasons, Grube(-Cioffi)-Matsumoto renders obvious Claim 30. *Id.*

(d) Claim 31

[31] "… wherein the broadcast signal is a communication message comprising video data, music data, or voice data."

Grube(-Cioffi)-Matsumoto renders obvious Claim 30. DISH-1003, ¶¶299-302.

As shown in Ground 1, Grube renders obvious Claim 31. *See* §IV(A)(2)(d)[31]. For those same reasons, Grube(-Cioffi)-Matsumoto renders obvious Claim 31. *Id.*

(e) Claim 32

[32] "… wherein each node of the BCN determines a respective common bit-loading modulation scheme for broadcasting to the other nodes of the BCN."

Grube(-Cioffi)-Matsumoto renders obvious Claim 32. DISH-1003, ¶¶303-

305.

Matsumoto discloses that "communication devices connected to the transmission path … to operate [as] either a virtual master or a slave" to enable "N-to-N communications." DISH-1007, 25:1-7. Each communication device in Matsumoto is configured to be able to interchangeably serve as a "virtual slave" or a "virtual master" to determine "mapping information." *See* §IV(C)(1). Matsumoto thus teaches the ability of each node in its network to determine a respective common bit-loading modulation scheme. DISH-1003, ¶304. It would therefore have been obvious to a POSITA to apply this functionality disclosed in Matsumoto to each of Grube's sites (or Cioffi's modems) to determine a respective common bit-loading modulation scheme. *Id.*

(f) Claim 33

[33] "… further comprising the transmitting node broadcasting a signal based on the common bit-loading modulation scheme to the plurality of receiving nodes simultaneously."

Grube(-Cioffi)-Matsumoto render obvious claim 33. DISH-1003, ¶¶306-309.

Matsumoto discloses that "mapping information" may be provided to "all the communication devices simultaneously" to allow "all the communication devices" to operate "based upon the mapping information." DISH-1007, 5:9-14. It would therefore have been obvious to a POSITA to implement Matsumoto's disclosure of

simultaneous transmission of "mapping information" to Grube(-Cioffi)'s system and method, such that Grube(-Cioffi)'s "LCD outbound control channel bit loading table" (claimed "common bit-loading modulation scheme") is transmitted to Grube's secondary sites (or Cioffi's remote modems) simultaneously. DISH-1003, ¶¶307-308.

(g) Claim 35

[35] "… wherein the broadcast signal comprises handshake data."

Grube(-Cioffi)-Matsumoto renders obvious Claim 35. DISH-1003, ¶¶310-313.

As shown in Ground 1, Grube renders obvious Claim 35. *See* §IV(A)(2)(e)[35]. For those same reasons, Grube(-Cioffi)-Matsumoto renders obvious Claim 35. *Id.*

(h) Claim 36

[36] "… wherein the broadcast signal is a communication message comprising video data, music data, or voice data."

Grube(-Cioffi)-Matsumoto renders obvious Claim 36. DISH-1003, ¶¶314-317.

As shown in Ground 1, Grube renders obvious Claim 36. *See* §IV(A)(2)(f)[36]. For those same reasons, Grube(-Cioffi)-Matsumoto renders obvious Claim 36. *Id.*

(i) Claim 37

[37] "… wherein each controller of the plurality of controllers determines a respective common bit-loading modulation scheme for broadcasting to the other controllers of the plurality of controllers and the first controller."

Grube(-Cioffi)-Matsumoto renders obvious Claim 37. DISH-1003, ¶¶318-320.

Grube(-Cioffi)-Matsumoto renders obvious each node of the broadband coaxial network determining a respective common bit-loading modulation scheme for broadcasting to other nodes in the network. *See* §IV(C)(3)(e)[32].

(j) Claim 38

[38] "… wherein the first controller is further configured to broadcast a signal based on the common bit-loading modulation scheme to the plurality of controllers simultaneously."

Grube(-Cioffi)-Matsumoto renders obvious Claim 38. DISH-1003, ¶¶321-323.

Grube(-Cioffi)-Matsumoto renders obvious the broadcast signal based on the common bit-loading modulation scheme being broadcast to the plurality of receiving nodes simultaneously. *See* §IV(C)(3)(f)[33].

V. DISCRETION SHOULD NOT PRECLUDE INSTITUTION

A. The *Fintiv* Factors Favor Institution—§314(a)

Institution is consistent with the Director's guidance on applying the *Fintiv* Factors. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020)

(precedential) ("*Fintiv*"); *Memorandum: Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (June 21, 2022) ("*Director's Guidance*"). A holistic analysis of the *Fintiv* framework favors institution. *Fintiv*, 6.

1. Factor 1: Institution Supports Stays in Parallel Proceedings

Institution would enable the Board to determine validity and allow the District Court to stay several litigations involving the '450 patent. Petitioner will seek a stay, and the opportunity for simplification increases the likelihood the court will grant a stay in view of IPR institution. *C.R. Laurence Co., Inc. v. Frameless Hardware Co., LLC*, 2:21-cv-01334-JWH-RAO (CDCA, Dec. 9, 2022); *Guy A. Shaked Investments, Ltd. et al. v. Trade Box, LLC*, 2:19-cv-10593-AB-MAA (CDCA, Nov. 18, 2020); *Masimo Corp. v. Apple Inc., 8:20-cv-00048-JVS-JDE* (CDCA, Oct. 13, 2020); (all granting motions to stay pending IPRs).

2. Factor 2: The Board's FWD Will Likely Issue in Advance of Any Foreseeable Trial

The District Court case was filed on February 10, 2023, but due to multiple motions to dismiss, DISH did not answer until September 21, 2023. The trial date has not been set, and the median time to trial in CDCA for all civil cases is 28.4 months. DISH-1023. For patent cases, that number increases to **34.4 months**. DISH-1025. The August 2025 anticipated Final Written Decision ("FWD") would

thus be well before a median time-estimated trial date in December 2025. The District Court set a Claim Construction Hearing for September 17, 2024 and may adjust its schedule to ensure a trial date after the FWD. DISH-1024.

This factor thus favors institution. And even if it did not, "the proximity to trial should not alone outweigh" other factors. *Director's Guidance*, 8.

3. Factor 3: Petitioner's Diligence Outweighs the Parties' Investment in the Litigation

The District Court proceeding is in its early stages, and investment has been minimal. The court has not issued a full schedule, or set a trial date, and claim construction briefing will not begin until July. DISH-1024.

Patent Owner asserted twelve patents, but only ten remain after resolution of DISH's motion to dismiss. Further, Patent Owner's September 2023 infringement contentions first disclosed all asserted claims. This factor thus favors institution. *See*, *e.g.*, *Apple Inc. v. Seven Networks LLC*, IPR2020-00156, Paper 10 at 11-12 (PTAB Jun. 15, 2020); *Sotera*, 16-17; *Mylan*, IPR2018-01680, Paper 22 at 18.

4. Factor 4: The Petition Raises Unique Issues

DISH asks the Board to consider the unique challenges raised in the Petition, including claims 34-38, which are not asserted against DISH in the district court. *See Fintiv*, 12-13. And if the Board institutes the pending Petition, DISH will not pursue district court invalidity challenges based on the same grounds in this petition

pursuant to 35 U.S.C. §315(e), thereby eliminating any risk of duplicated efforts.

5. Factor 5: DISH's Involvement in Parallel Proceedings

The parties are the same in this IPR and the District Court proceeding.

6. Factor 6: The Merits Support Institution

The *Fintiv* factors "are part of a balanced assessment of all the relevant circumstances in the case," and "if the merits of a ground raised in the petition seem particularly strong…the institution of a trial may serve the interest of overall system efficiency and integrity." *Fintiv*, 14-15. The grounds raised here are strong, and institution will likely result in invalidation of all claims.

B. The *Advanced Bionics* Test Favors Institution—§325(d)

The petition's references were not considered or cited during prosecution of the '450 Patent. Thus, none of Grounds 1-4 involve the same or substantially the same prior art or arguments previously presented to the Office.

Accordingly, neither condition of the first prong of the *Advanced Bionics* framework is met, and there is no need to reach the second prong to resolve against discretionary denial under §325(d). *See, e.g.*, *Oticon Medical AB et. al. v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 20 (PTAB Oct. 16, 2019) (precedential) (instituting review due to "new, noncumulative prior art asserted in the Petition"). If the second factor is considered, the Examiner erred by failing to consider, or identify during a search, relevant references, such those herein. Thus, discretionary

denial under §325(d) is not warranted.

VI. FEES—37 C.F.R. §42.103

Please apply any fees to Deposit Account No. 06-1050.

VII. CONCLUSION

Petitioner respectfully requests institution and cancellation of all Challenged Claims.

MANDATORY NOTICES—37 C.F.R §42.8(a)(1)

A. Real Party-In-Interest—37 C.F.R. §42.8(b)(1)

DISH Network L.L.C. is petitioner and real party-in-interest. DISH Network Corporation, DISH Network Service L.L.C., and DISH Network California Service Corporation are additional real parties-in-interest. No other party had access to or control over the filing of this Petition, and Petitioner did not file this Petition for the benefit of any other party or entity.

B. Related Matters—37 C.F.R. §42.8(b)(2)

Petitioner is not aware of any disclaimers, reexamination certificates, or petitions for *inter partes* review for the ’450 patent.

Petitioner is aware of the following civil actions involving the subject matter for the ’450 patent.

Case Number	Filing Date
Entropic Communications, LLC v. DirecTV, LLC f/k/a DirecTV, Inc. et al., 2-23-cv-05253 (CDCA)	July 1, 2023
Entropic Communications, LLC v. DISH Network Corporation et al., 2-23-cv-01043 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Cox Communications, Inc. et al., 2-23-cv-01047 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Comcast Corporation et al., 2-23-cv-01048 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Charter Communications, Inc., 2-23-cv-00050 (EDTX)	February 10, 2023

C. Lead And Back-Up Counsel Under 37 C.F.R. §42.8(b)(3)

Petitioner provides the following designation of counsel.

Lead Counsel	Backup counsel
Adam R. Shartzer, Reg. No. 57,264 Fish & Richardson P.C. 60 South Sixth Street, Suite 3200 Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 Email: IPR45035-0031IP1@fr.com	Ruffin B. Cordell, Reg. No. 33,487 Ashley A. Bolt, *pro hac vice* Wonjoon Chung, *pro hac vice* Tyler R. Train, Reg. No. 76,108 Vivian C. Keller, Reg. No. 79,387 Timothy Riffe, Reg. No. 43,881 Usman Khan, Reg. No. 70,439 Fish & Richardson P.C. 60 South Sixth Street, Suite 3200 Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 IPR45035-0031IP1@fr.com

D. Service Information

Please address all correspondence and service to the address listed above. Petitioner consents to electronic service by email at IPR45035-0031IP1@fr.com.

Respectfully submitted,

Dated: February 9, 2024

/Adam R. Shartzer/
Adam R. Shartzer, Reg. No. 57,264
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
T: 202-783-5070
F: 877-769-7945

(Control No. IPR2024-00560)

Attorneys for Petitioner

CERTIFICATION UNDER 37 CFR §42.24

Under the provisions of 37 CFR §42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,963 words, which is less than the 14,000 allowed under 37 CFR §42.24.

Dated: February 9, 2024

/Adam R. Shartzer/
Adam R. Shartzer, Reg. No. 57,264
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
T: 202-783-5070
F: 877-769-7945

Attorney for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on February 9, 2024, a complete and entire copy of this Petition for *Inter Partes* Review, Power of Attorney, and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661
(312) 775-8000

/Crena Pacheco/
Crena Pacheco
Fish & Richardson P.C.
60 South Sixth Street
Minneapolis, MN 55402
pacheco@fr.com